DISEASES *of the* CHEST

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A Common Masquerading Lung Disease*

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There is a masquerading lung disease which in many cases gives quarter for a short time in its life history, and then invariably produces death. Any illness which induces a patient to visit a doctor at a time when the doctor may act to avert certain death presents a real challenge. The challenge is felt all the more keenly by those of us who have declared a special interest in chest disease. The responsibility is a practical one, for this masquerading lung disease is common. It can be discovered at a favorable time, and in many instances it may be curable. The following aspects of the problem will be considered:

1) Unique features concerning symptoms, physical signs and x-ray shadows.

2) The time interval between onset of symptoms, first visit to the doctor, first chest x-ray and verified diagnosis.

3) Factors which should increase curability in the future.

4) Similarity of case finding problem to tuberculosis program.

This masquerading lung disease, which often gives quarter for a short time before the fatal issue, is similar to tuberculosis in many ways. Both diseases are unique for they masquerade as other acute or chronic conditions of the lung. Both are unique as symptoms are not reliable in the early stages. Both diseases are unique as there are no early reliable physical signs. Both are unique for in the early stages a single x-ray film will usually show some abnormality. Both diseases are unique for in spite of obscure clinical factors the diagnosis can be accurately made in a high percentage of cases. Lastly, there is a similarity between tuberculosis and this masquerading disease, as successful treatment depends to such a large degree upon early discovery.

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However, the two diseases are different in respect to the predominant age groups affected. Tuberculosis concerns principally the age group between 15 and 40, whereas this masquerading lung disease usually affects those between the ages of 40 and 65. The diseases are totally different in respect to the matter of time. In tuberculosis, time plus rest is often a useful ally of the patient in regaining health. In the lung disease which is under discussion, the element of time is always an enemy of the patient. Prolonged observation and rest treatment never improve upon the situation, but rob the patient of his only chance for possible cure.

The unreliable nature of symptoms and physical signs can best be emphasized by summarizing the histories of 165 patients who were suffering from this masquerading lung disease. It was found that when they first consulted a doctor the symptoms were usually those common complaints which are encountered in almost any chronic chest condition. The symptoms in the order of their frequency were as follows:

Cough	136
Chest pain	70
Chills and fever	60
Hemoptysis	61
Dyspnea	56
Weight loss	54
Weakness	45
Wheezing	10
G. I. symptoms	10
Arthritis	4

Eighty-two percent of all the patients complained of a chronic cough. The persistent and harrassing nature of the cough was troublesome enough to induce them to ask for help. It is significant that 92 per cent of all the patients had as a first symptom one that directed attention to the chest when the first doctor was seen. A review of symptoms complained of by this group of patients strongly suggests that it would be impossible to set apart any group of symptoms which might be considered pathonomic of this masquerading disease.

The physical signs which were elicited in this group of patients included many alterations from the normal. In fact, they were so variable that a significant grouping cannot be given. In those patients examined during the early stage of the disease, physical signs were frequently absent altogether. When present, they were variable and often misleading. Changes in the percussion note indicated consolidation in some, fluid in others, and in a few cases localized emphysema. Breath sounds were altered to suggest congestion, con-

solidation or cavitation. The character of the breathing and auscultatory sounds suggested different degrees of bronchial obstruction in some cases. At times a shift was noted in the position of the mediastinum and heart, either to the side of the lesion or away from it. Therefore, the mention of physical signs is done merely to emphasize their utter unreliability.

It is quite obvious that the term "masquerading lung disease" has been used advisedly, for 63 per cent of the patients in this series were incorrectly diagnosed by the first doctor consulted. Furthermore, treatment based upon an erroneous diagnosis was maintained for long periods of time. The various conditions for which treatment was given were as follows:

Tuberculosis	40
Unresolved pneumonia	18
Lung abscess	13
Bronchitis	11
Asthma	5
Heart disease	4
Pleurisy	4
Metastatic malignancy	2
Miscellaneous	9
	104
	(63% of series)

It is important to emphasize that the disease was confused with pulmonary tuberculosis more frequently than any other disease. This indicates that the two diseases cannot be divorced in consideration of differential diagnosis and that many cases will undoubtedly be diverted through the tuberculosis case finding clinics. The disease was frequently labeled unresolved pneumonia. This fact can be used as a strong argument against ever being satisfied with such a diagnosis. Before an inflammatory lesion can be considered as unresolved, the possibility of an underlying cause for chronicity should be ruled out.

The disease masqueraded all too long after the patient made his first visit to a doctor. In 125 histories, accurate data could be obtained concerning the time relationship between the important steps which led to a verified diagnosis. Two significant facts were ascertained. First, 36 per cent of the patients placed themselves under medical supervision at onset or within a month of the onset of symptoms. The second fact was that the average patient saw a doctor within three months of onset but did not have an x-ray of the chest for another three months. The true diagnosis was not established until nine months after the first doctor saw the patient.

(See Figure 1.) These two observations must be interpreted as indicating:

First, that fortunately early symptoms are of such a character that many patients are forced under medical supervision early;

Second, that the possibility of a fatal type of lung disease was not even considered in early differential diagnosis in the average case of this series;

Third, that misinterpretation of abnormal x-ray shadows was partially responsible for the delay in the true diagnosis.

It can be said without reservation that the x-ray is by far the most valuable means available for apprehending pulmonary disease. However, a distinction must be made between its value in yielding presumptive and absolute evidence. In 98 per cent of the cases under discussion, the first x-ray indicated the presence of trouble. Why should there have been a delay of 6 months from this time until the absolute diagnosis was made? An explanation may be found in the fact that in the majority of cases, the primary pathological process failed to produce a shadow of itself upon the film or fluoroscopic screen. The changes that were noted were secondary effects and these were of a highly variable nature. For example, in Figure 2 are reproduced the x-ray films of four patients with identical disease. These films illustrate the great variation in shadows which may be encountered. The multiplicity of effects as shown by x-ray becomes less confusing when it can be shown that the disease

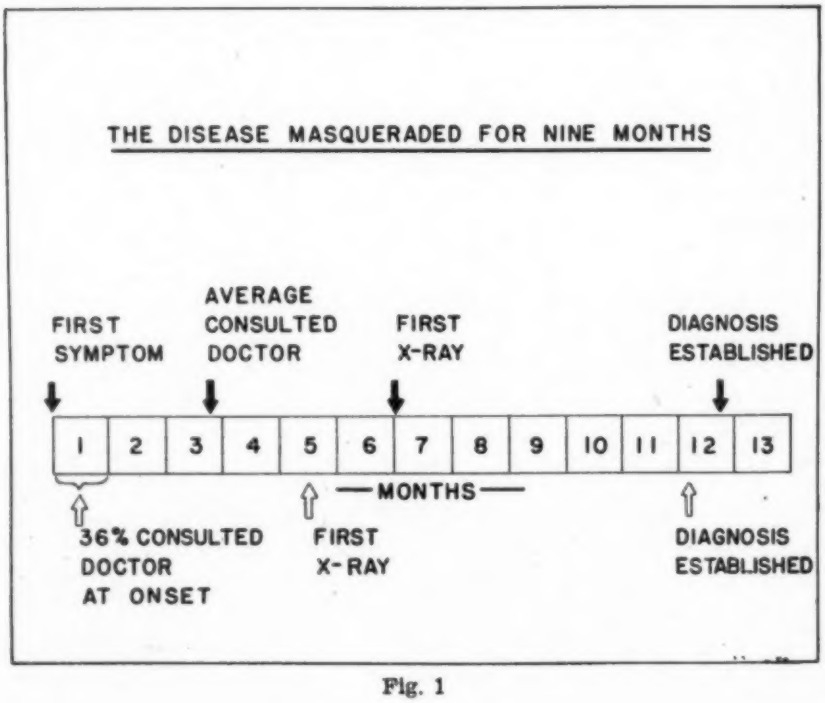

Fig. 1

is one which involves a part of a branching bronchial system. The bronchi lead to a complicated pattern of pulmonary segments, the shadows of which are overlapped on the film. One or a combination of segments or lobes may be involved in various ways depending upon the position of the lesion in the communicating bronchi of those segments or lobes. The obstruction may be partial or complete. The element of infection may or may not be added. Lobular atelectatic shadows in the upper lobe may closely resemble infiltration or cavitation of tuberculosis. For example, in Figure 3 two such cases are illustrated. In the majority of cases in this series, there was evidence of a superimposed infection. Uncertain or confusing shadows in the routine postero-anterior exposure often become obvious lobular atelectatic shadows in the lateral or oblique films. There was a minority group (21 per cent) where the pathologic process itself produced a discrete area of increased density in some region of the lung field. In the majority of these cases, the true diagnosis was suspected without delay. In some, consideration of surgical treatment was postponed in order to ascertain the effect of deep roentgen ray therapy. For example, in Figure 4 there are reproduced the films of two illustrative cases. In neither case did radiation slow down the progress of the lesion. In one case, total pneumonectomy was still possible and was successfully performed. In the other, a metastatic brain lesion was discovered when the patient was finally referred for surgical treatment.

It was possible in 95 per cent of the cases in this series to establish an unequivocal diagnosis during life. The relative frequency with which the various methods were used in confirmation of the diagnosis is shown in Figure 5. It is significant that the lesion causing this masquerading disease is strategically located in the main stem bronchus in the majority of cases, and is accessible for biopsy. Fortunately, small lesions may be discovered in this way even at the very beginning of their development.

The second most valuable method of settling the diagnosis was exploratory thoracotomy. This method was used in all cases where the diagnosis of cancer was suspected and evidence of metastatic disease was lacking. Biopsy by aspiration was reserved for two groups of cases. It was used in suspected cases where there was definite or strong evidence of an extrapulmonary extension of the growth. It was also of value when advanced age or complicating factors precluded surgical treatment. There is a serious objection to relying wholly on aspiration biopsy to settle the issue in all suspected cases of primary cancer of the lung should they prove to be inaccessible bronchoscopically. In the first place, in the event of either a positive or negative aspiration, exploratory thoracotomy is indicated if evidence of an extrapulmonary extension is lack-

ing. Secondly, pulmonary suppuration is frequently superimposed. Needling an infected lung is rarely good surgical practice. The differentiation of pulmonary abscess and peripheral tumor can usually be made on the basis of history and roentgen appearance. If aspiration is considered desirable, this can be done under direct vision through a small exploratory thoracotomy incision with reasonable safety.

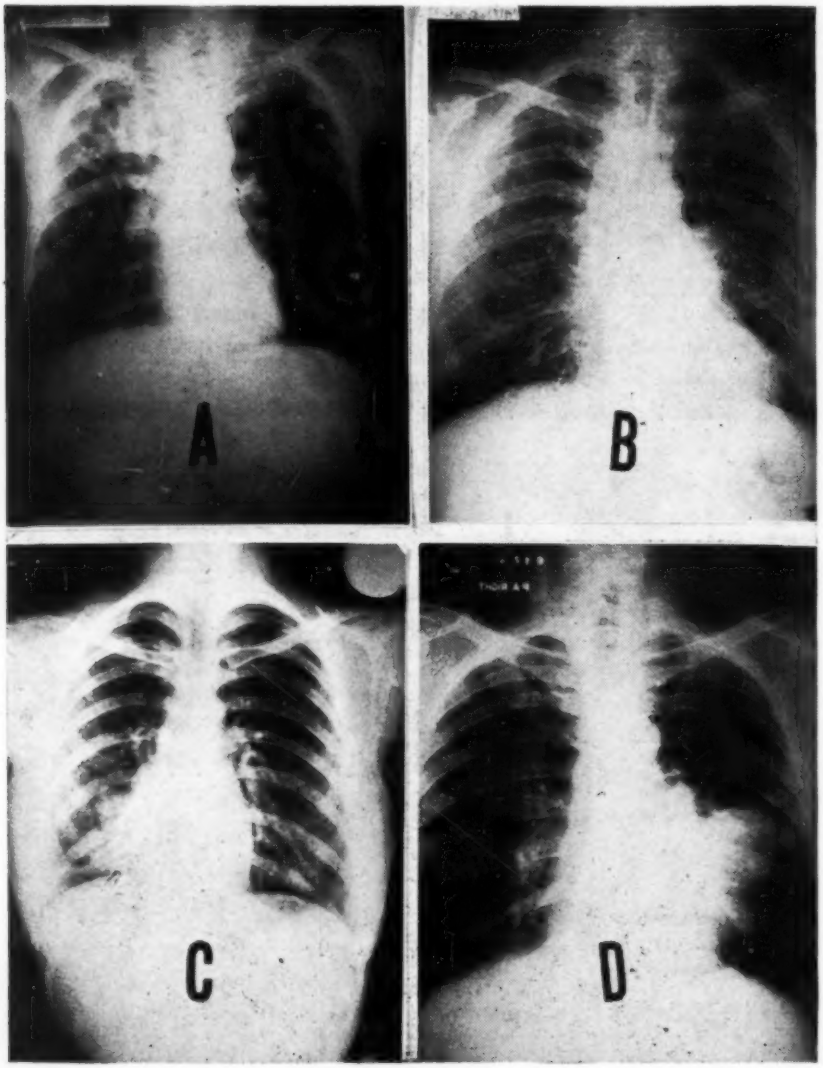

Fig. 2—Chest roentgenograms of four patients who were suffering from the same masquerading lung disease. Note the great variation in the location, distribution and character of the abnormal shadows.

A. Mr. S. K., age 55. Patient first treated for pneumonia. He then spent 5 months in a tuberculosis sanatorium under an erroneous diagnosis. Bronchoscopy was negative. Surgical exploration revealed epidermoid carcinoma, Grade III, with involvement of mediastinal nodes. Palliative pneumonectomy was successfully performed.

The value of exploratory thoracotomy in suspected cases of malignancy can be illustrated by reporting on benefits derived in a group of such patients who were negative bronchoscopically.

Carcinoma suspected. Clinical evidence of extrapulmonary extension lacking. Surgery offered	60
A. No benefit	
1. Refused operation	7
2. Explored-inoperable	27
B. Benefited	
1. Palliative pneumonectomy	6
2. Diagnosis of carcinoma disproved. Appropriate surgical treatment given	11
3. Early lesions found—pneumonectomy	12

The salvage of patients in the carcinoma suspect group proved to be 28.5 per cent of those who accepted advice and were found to have malignancy. As the campaign for early diagnosis progresses, the percentage of bronchoscopically negative cases will increase and the net salvage will also climb.

The histological study of tissue removed in this series of cases revealed that approximately one-half were of the epidermoid type. The frequency with which the various histological types of cancer were encountered is as follows:

Epidermoid carcinoma	80
Grade I	11
Grade II	31
Grade III	15
Ungraded	23
Adenocarcinoma	28
Carcinoma simplex	20
Undifferentiated	8
Unclassified	29

B. Mr. N. W., age 55. Lesion was spotted in left hilum by fluoroscopy during the course of gastro-intestinal studies. Weakness and gastro-intestinal disturbances had been the only symptoms. Bronchoscopy was negative. Surgical exploration revealed epidermoid carcinoma, Grade I, with all mediastinal nodes negative. Total pneumonectomy was followed by an uneventful convalescence. Now, 18 months later, the patient is well and free of signs of metastatic disease.

C. Miss M. W., age 18. Blook-streaked sputum recurring over an interval of six months led to a diagnosis of tuberculosis. Bronchoscopy revealed an obstructing lesion in the right middle lobe bronchus. The biopsy was reported as benign adenoma. Total pneumonectomy was successfully performed. The pathological report on the surgical specimen was adenocarcinoma. Patient is well 3½ years after operation.

D. Mr. M. S., age 51. Cough and night sweats had been present for three months. The character of the shadow in the left lung field immediately aroused suspicion, and bronchoscopy revealed an epidermoid carcinoma. A palliative resection was performed, and the patient was discharged as temporarily improved 28 days later.

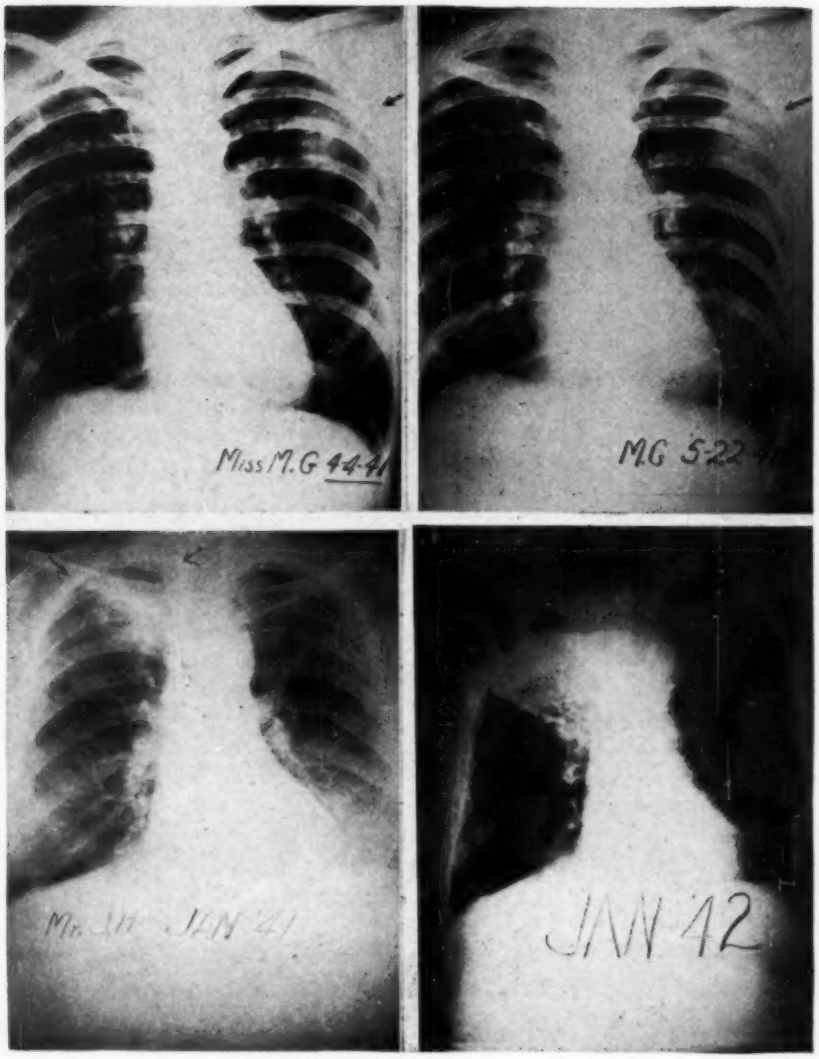

Fig. 3—Roentgenograms of two cases which illustrate how closely this disease may simulate tuberculosis. In neither case did time improve upon the situation.

Upper—Miss M. G., age 52. Weakness, cough and chest discomfort had been present for six months. Note the progression that took place in six weeks' time. The pathological report on the surgical specimen was epidermoid carcinoma, Grade I, with mediastinal node involvement.

Lower—Mr. J. H., age 68. Chronic cough had been present all his life, but a change in the character of the cough had taken place three years previously. Note early cavitating lesion and lobar atelectasis demonstrable one year later. Surgery was not recommended because of poor general condition of the patient when such treatment was first considered.

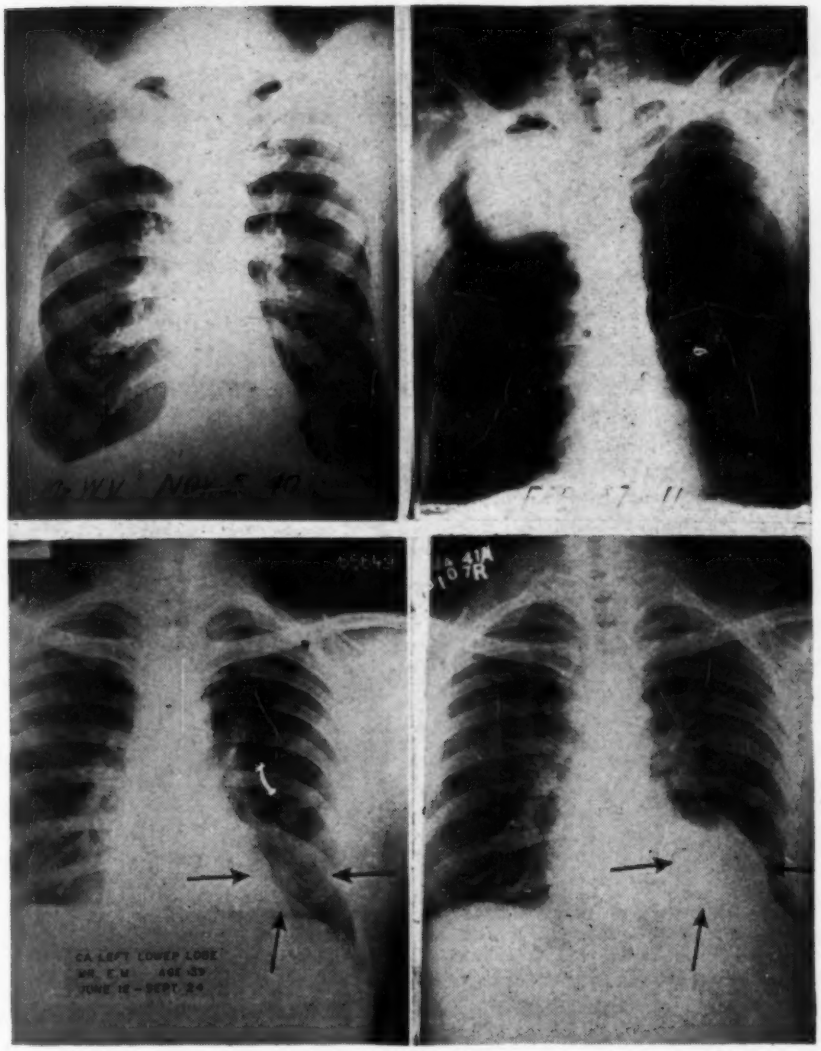

Fig. 4—Films of two cases suffering from peripheral types of primary malignancy in whom the condition was suspected, but surgical consideration was delayed to give deep x-ray therapy a trial. Note change in size of tumor shadow by adding the factor of time.

Upper—Mr. E. M., age 39. Weight loss, weakness and night sweats had been present for six months. The lesion progressed during therapy period of massive radiation. When surgery was first considered, evidence of a metastatic brain tumor was present.

Lower—Mr. W. V., age 44. Fatigability and multiple arthritis had been present for 14 years. When a persistent cough appeared 7 months later, the first x-ray was taken. The discrete shadow of the tumor was clearly shown. Radiation was given during the interval between films—November to February. Exploratory thoracotomy revealed an epidermoid carcinoma, Grade III, with all nodes negative. A total pneumonectomy was performed 18 months ago with no evidence of recurrence to date.

Although the pathologist* was certain of the presence of malignancy in all of the specimens submitted,** it was impossible in some of the bronchoscopic and aspiration biopsy specimens to be sure of histological types. In many instances either the surgical specimen or a biopsy removed during exploration was available to supplement the study.

For a period of ten years, surgery has been available in the treatment of lung cancer. A creditable showing has been made during this early period. For example, 2 out of every 5 cases explored have been found to be free of an extrapulmonary extension. (See Figure 6.) The percentage of the entire group of verified cases for whom there was some hope of cure was 20 per cent. This ratio seems respectably high when it is remembered that prior to 1933 there was no reason to believe that any patient could be cured. As a reward for our efforts, there remains 13 per cent (20 patients) of the entire group which constitutes the net salvage. These patients are all reasonably well and are all free of evidences of metastatic disease. The post-operative period is sufficiently long to warrant the use of

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**Only verified cases have been included in this study.

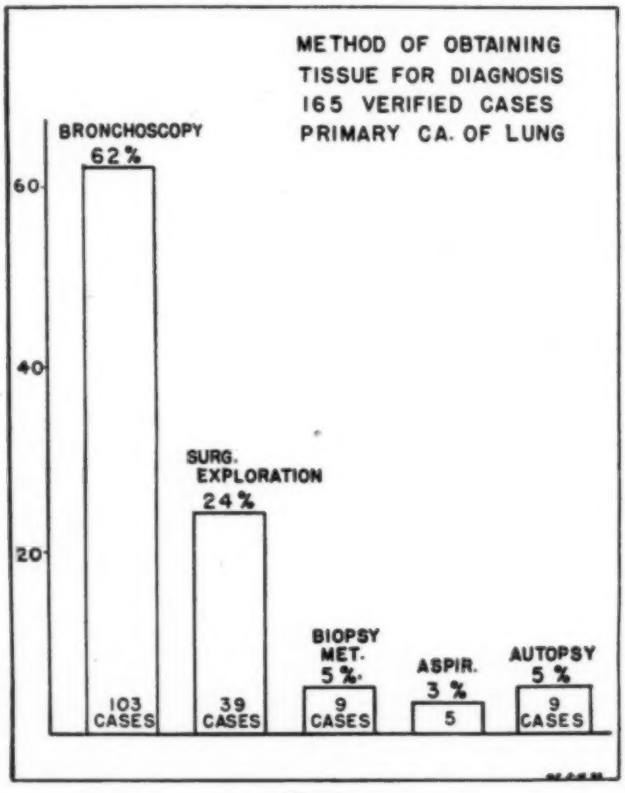

Fig. 5

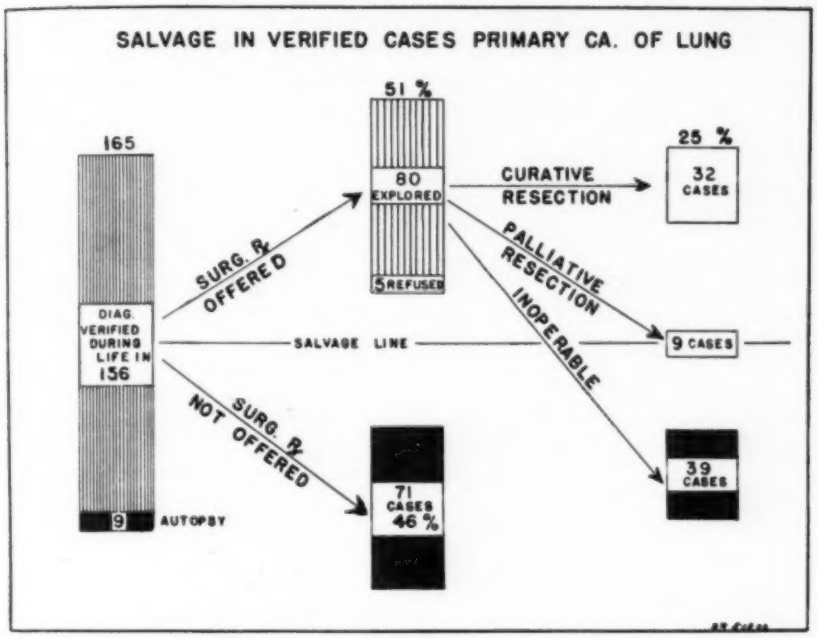
SALVAGE IN VERIFIED CASES PRIMARY CA. OF LUNG
165
DIAG. VERIFIED DURING LIFE IN 136
9 AUTOPSY
SURG. Rx OFFERED
51 %
80 EXPLORED
5 REFUSED
CURATIVE RESECTION
25 %
32 CASES
PALLIATIVE RESECTION
INOPERABLE
SALVAGE LINE
9 CASES
SURG. Rx NOT OFFERED
71 CASES 46 %
39 CASES

Fig. 6

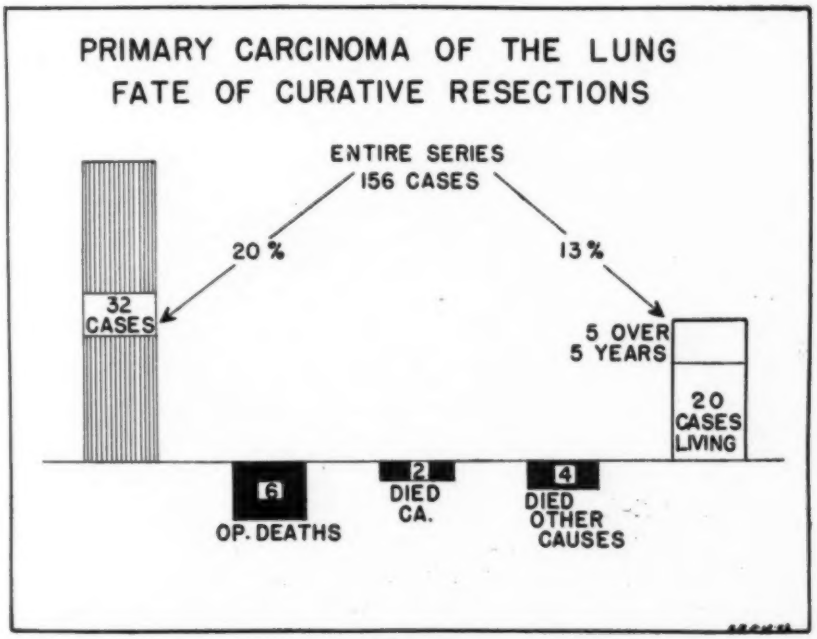
PRIMARY CARCINOMA OF THE LUNG
FATE OF CURATIVE RESECTIONS
ENTIRE SERIES
156 CASES
20 %
13 %
32 CASES
5 OVER 5 YEARS
20 CASES LIVING
6 OP. DEATHS
2 DIED CA.
4 DIED OTHER CAUSES

Fig. 7

the term "cure" in respect to the treatment of five patients, as they have passed the five-year mark. (See Figure 7.)

If at any time cancer ever challenged the profession, cancer of the lung should now. The lung is the only site where cancer has shown a significant rising trend in frequency. The increase has been shown to be an absolute as well as a relative one. This is all the more alarming. Autopsy reports from large city hospitals where admissions are unselected indicate that 10 to 20 per cent of all cancer deaths are due to lung cancer. In most reports it is exceeded in frequency only by gastric malignancy as a cause of death. At the Charity Hospital in New Orleans, Halpert[1] found that in a year-by-year analysis the number of cases of cancer of other organs remained essentially the same, whereas lung cancer showed a steady and significant increase. In fact, in the last two years reported lung cancer exceeded cancer of the stomach and assumed first place. (See Table 1.) Although death certificates are not as reliable as

TABLE I

REGIONAL DISTRIBUTION OF CARCINOMA, CHARITY HOSPITAL OF LOUISIANA AT NEW ORLEANS

1931 to 1940

Year	*Necropsies on Persons Over 1 Year Old*	*Lung*	*Stomach*	*Biliary System*	*Pancreas*
1931	628	3	15	7	1
1932	772	9	22	2	9
1933	906	9	19	10	8
1934	909	11	22	5	7
1935	921	7	22	4	5
1936	1072	13	19	4	9
1937	837	13	21	9	2
1938	828	16	19	11	4
1939	967	24	22	7	8
1940	932	30	24	7	13
Total	8862	135	205	66	66

post-mortem figures, vital statistics show a progressive rise of lung cancer throughout the United States. Ochsner and deBakey[2] in a general survey found the death rate for cancer of the lung to be 3.6 per hundred thousand in 1936, whereas it was only 1.1 in 1920.

What practical steps can be taken by those of us who are particularly interested in chest disease in the matter of bringing these cases to light during their curable stage? We need but to turn to

the record on tuberculosis case finding. The profession generally has been taught that if tuberculosis is to be discovered during its minimal stage it is necessary to ignore absent or insignificant symptoms and physical signs and go immediately to the x-ray for bringing the cases to light. The same can be said for the apprehension of early lung cancer. Reliance cannot be placed upon symptoms or physical signs. The x-ray must be used to spot possible cases who come to a doctor complaining of any chest symptom. This concerns principally the age group of 40 to 65. Screening the population does not have to be as complete as is necessary in the tuberculosis campaign, as there is not the contact problem to face. However, our efforts can be confined to those patients who come to doctors because of chronic chest symptoms and to those who have been taught to submit to an annual physical examination. The cost of such routine single films must be low enough to make their inclusion a practical part of the routine physical examination. General surgeons have lamented for years the fact that expensive roentgenologic examinations, both fluoroscopy and multiple films, have been necessary to ferret out cases of carcinoma of the stomach. However, to screen the patient population for pulmonary lesions is a much simpler and less expensive proposition. The single film, standard or miniature, can be taken by a technician and in mass production. Upwards of 100 chest films can be read by the chest specialist within an hour. The cost of this routine step in diagnosis can be made relatively inexpensive. For those patients unable to pay for a single film, the free tuberculosis case finding clinics are almost universally available. In fact, a significant proportion of the early cancer cases is being discovered in these clinics today. It is possible, therefore, for any patient who comes to a doctor because of chest symptoms to have a single film as a part of the routine examination.

CONCLUSIONS

The established fact of frequency and curability of primary cancer of the lung places before us a dual responsibility. Those doctors first consulted must apprehend the disease during its early stages. The thoracic surgeon must provide a thorough and safe operation. How may the first doctor consulted set in motion the mechanism of early discovery?

He may save valuable time for the patient if he remembers:

1) That cancer of the lung is now one of the most important diseases of the chest in patients within the age period from 40 to 65 years, particularly in men. (In the author's series of patients, the average age was 55 years, and the ratio of men to women was 3.5 to 1.)

2) That many patients do ask for help at a time when the lesion is still confined to the lung.

3) That symptoms and signs are either absent or are misleading in the early stages.

4) That the earliest lesions will in almost every instance give some telltale or suspicious shadow on a single x-ray film, and

5) Finally, he must remember that there are two methods available for settling the diagnosis:

First: That the majority of lesions are visible bronchoscopically and are accessible for biopsy, and

Second: That when the diagnosis cannot be verified bronchoscopically, it is possible to explore the chest safely, settle the diagnosis, and carry out curative treatment if necessary.

Cancer of the lung need not be a masquerading lung disease. It is too common to let us forget it. Facilities are universally available to make its apprehension possible. For many patients early discovery will be rewarded by a reasonably good chance for cure.

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CONCLUSIONES

La frecuencia con que ocurre y la curación del cáncer pulmonar primario son hechos demostrados que nos presentan una doble responsabilidad. Aquellos médicos a quienes el enfermo consulte primero deben descubrir la enfermedad en sus períodos tempranos. El cirujano del tórax debe proveer una operación completa y sin riesgo. ¿Qué ha de hacer, pues, el médico a quien se le consulte al principio para llevar a cabo el procedimiento que resultará en descubrir el mal tempranamente?

El tiene la oportunidad de ahorrarle tiempo valioso al enfermo si recuerda lo siguiente: (1) Que el cáncer pulmonar es hoy una de las enfermedades del pecho más importantes en personas de 40 a 65 años de edad, especialmente en los hombres. (En la serie de enfermos tratados por el autor, la edad media fue 55 años, y la proporción de hombres a mujeres fue 3.5 a 1.) (2) Que muchos enfermos buscan alivio cuando la lesión todavía se encuentra limitada al pulmón. (3) Que los síntomas y signos en los períodos tempranos de la enfermedad o no existen o son engañosos. (4) Que en casi todos los casos las primeras lesiones de la enfermedad producirán en la película radiográfica aislada sombras características o, por lo menos, sospechosas, y (5) Finalmente, que debe él recordar que tiene a su disposición dos técnicas para afirmar el diagnóstico:

Primero: que la mayoría de las lesiones pueden visualizarse por medio de la broncoscopía y se encuentran en un lugar de fácil acceso para obtener tejido para el examen biópsico; y Segundo: que cuando el diagnóstico no se puede verificar mediante el examen

broncoscópico es posible hacer una operación torácica de exploración sin correr mucho riesgo, hacer el diagnóstico bien definido, y llevar a cabo la terapéutico que sea necesaria.

El cáncer del pulmón no debe ser una enfermedad pulmonar disfrazada, difícil de diagnosticar. Es demasiado común para que nos olvidemos de ella. Los medios necesarios para su diagnóstico existen universalmente. En muchos enfermos el descubrimiento temprano de la enfermedad ofrece la probabilidad razonablemente buena de obtener una curación.

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The Coexistence of Pathogenic Fungi in Certain Chronic Pulmonary Diseases: With Especial Reference to Pulmonary Tuberculosis

(A Preliminary Report)

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It is commonly known that various species of fungi are frequently found in the sputum of normal persons, and that they are harmless saprophytes in most of these individuals. We believe diseases of the bronchi and lungs associated with the presence of parasitic and pathogenic fungi in the sputum are not rare, and that sufficient attention has not been paid to them.

The fungi pathogenic to the bronchi and lung tissues are the higher fungi, the Eumycetes, which are described by Castellani as "unicellular or pluricellular filamentous plants, of larger dimensions than bacteria, which multiply by processes rather than simple cell fission, usually by means of asexual or sexual spores." Three classes of Eumycetes affect the human respiratory tissues, and may be described as follows:

Class I—Fungi imperfecti (Hyphomycetes), which consist of a mass of filaments, and are reproduced by the formation of irregularly shaped and sized cells, born free from any receptacle, and asexually by a process of budding, septation and abstriction from the filamentous threads.

Class II—Ascomycetes, which consist of a receptacle in which are formed endospores, limited in number to two, four, or eight, the number being constant for that particular species producing them. Rarely are filamentous attachments to the receptacle present.

Class III—Phycomycetes, which have a nonseptate filament in the vegetative stage, and reproduce in a sexual manner by the union of two undifferentiated cells.

In a previous paper[1] by one of us, a classification, adapted from Castellani,[2] was found helpful in succinctly showing the orders, suborders, families, and genera of fungi found in bronchomycoses. We have used that classification mainly, but have modified it by incorporating some of the ideas of Henrici,[3] Dodge,[4] and others.[5] We have attempted to indicate the proper relationships of the various species to their genera, taking into consideration all the species of fungi which have been reported, even a single case, as the cause of bronchial or pulmonary pathology. In addition, in some instances, for

example, the Nocardiaceae, we have included species which have been found only in the mouth sputum and not in the lungs. The complexity of this subject may be seen by reading Table I; and candor causes us to state that we are approaching this discussion with considerable trepidation.

The present report embraces the major details of a study of the presence of pathogenic fungi in the sputum of patients who had been diagnosed previously as having pulmonary tuberculosis. The time allotted for the presentation of this paper will not permit a detailed review of our investigation. In a subsequent paper we will more fully amplify our findings and include such data as complement fixation reactions, agglutinations, intradermal response to the fungus antigen, cultural characteristics, biochemical tests, animal inoculations and subsequent cultural studies from the lungs, and autopsy records. Realizing that the finding of fungi in the sputum from the mouth would be slight proof of the presence of fungi of pathological import in the patients to be studied, we devised a simple method to obtain sputum from the trachea. The apparatus consisted of a glass syringe with an attached catheter, within which was placed a wire to give it rigidity. It was easy to lightly cocainize the throat and slip the catheter into the trachea. Two or three cubic centimeters of sterile saline solution, having been placed in the syringe, were quickly injected into the trachea, and immediately aspirated back into the syringe. The position of the tip of the catheter was checked by roentgenograms, which showed the location of the wire, sufficiently often for us to know all our aspirations were from the trachea, and not from the throat.

During a period of two and one-half years (March 1937 to September 1940) one of us (H. N. G.) personally collected fresh sputum from 301 patients, mainly at the Houston Tuberculosis Hospital. These patients were required under his rigid supervision to thoroughly cleanse their teeth, rinse their mouths with warm, sterile, normal saline solution, and directed to cough and expectorate into sterile, wide-mouthed bottles, which were sealed at once, and carried to our laboratory. The examination of smears was made immediately, and the material inoculated on Sabauraud's dextrose medium. In this manner we segregated all the patients who had fungi in their sputum, and only these individuals were later subjected to the tracheal aspiration to obtain material for intensive study. There were 301 patients whose oral sputum was collected, and we obtained identical fungi in both smears and culture in 45 (15%) of them. The 45 patients with sputum positive for fungi were selected for tracheal aspiration and investigation. From 18 of the 45 patients we obtained intratracheal washings which showed the same fungus previously found in the sputum; 27 of the washings were entirely

TABLE I
CLASSIFICATION OF PARASITIC FUNGI FOUND IN BRONCHOMYCOSES

EUMYCETES

CLASS I: Fungi imperfecti Subclass Hyphales (Hyphomycetes) Mycelium septate, asci absent

	Family	*Genus*	*Species*
Order I: Microsiphonales..... Mycelial hyphae bacilliform	Mycobacteriaceae Lehmann and Newmann—Definite mycelium absent (Note: Most authorities place Mycobacteriaceae in Schizomycetes (bacteria)	Vibriothriz Castellani	Vibriothriz zeylanica Castellani
	Midway between Mycobacteriaceae and Nocardiaceae (Note: Branching more marked than in mycobacterium and strictly anaerobic; mycelium less developed than nocardia)	Anaeromyces Castellani, Douglass and Thompson	Anaeromyces bronchitica Castellani, Douglass and Thompson
	Nocardiaceat Castellani and Chalmers Definite mycelium present	Nocardia Toni and Trevisan (aerobic)	(a) Have been found in bronchi and lungs: 1. Subsection Majora: N. bovis, N. albus, N. bicolor, N. pseudotuberculosae, Brumpt, N. japonicus, N. pseudotuberculosae Keller 2. Subsection Minora: N. indica, N. Leishmani, N. Riverei, N. asteroides 3. Subsection Brevis: N. pulmonalis, N. berestneffi, N. americanus (b) Have been found in sputum only: 1. Subsection Majora; N. candida, N. rubia, N. lingualis, N. spumalis, N. grypsoides, N. catarrhalis 2. Subsection Minora: N. gedansis, N. Pijperi, N. Donnae 3. Subsection Brevis: N. Minneacaus, N. Foulertoni, N. Loudinesis, N. fuscus, N. bronchialis Satory (Note: Subsections Majora, Minora and Brevis refer respectively to good, medium and slow growth on culture media.)
		Cohnistreptothrix Pinoy (anaerobic)	Cohnistreptothrix Krusei

CLASS I: Fungi imperfecti Subclass Hyphales (Hyphomycetes) Mycelium septate, asci absent

		Family	*Genus*	*Species*
Order II: Thallosporales Mycelial hyphae more than 1 micron in diameter; reproduction by thallosporales	Suborder Blastoporineae Reproduction by blastospores	Cryptococcoceae Kützing Hyphae and spores alike being yeastlike	Cryptococcus Kützing	Cryptococcus hominis Vuillemin Cryptococcus capsulatus Darling Cryptococcus pararoseus Castellani
		Toruleae Saccardo Mycelium dark colored, often black; no differentiation of sporophores; multiplication by arthrospores and chlamydospores, rarely sprouting	Torula Persoon	Torula histolytica
		Oosporaceae Saccardo Mycelium hyphae present, spores typically in chains	Monilia Persoon	Monilia albicans
			Oidium Link	Oidium lactis Link Oidium rotundatum Castellani Oidium asteroides Castellani Oidium matalense Castellani
Order III: Hemisporales Mycelial hyphae more than 1 micron: reproduction by hemispores		Hemisporaceae Castellani and Chalmers Have same characteristics as order	Hemispora Vuillemin	Hemispora rugosa Castellani Pararugosa, Castellani, Douglass and Thompson
Order IV: Conidiophorales Mycelial hyphae not bacilliform; reproduction by conidia	Suborder Aleuriosporineae Reproduction by aleuriospores	Aleurismaceae Vuillemin Conidiophores absent	Acladium Link	Acladium Castellani Cladosporium mansoni
			Acremoniella Saccardo	Acremoniella Perini
	Suborder Sporotrichineae Reproduction by true conidia; true conidiophores absent	.....	Sporotrichum Link	Sporotrichum schencki Sporotriuchum beurmanni Sporotrichum dori de Beurmann and Gougerot Sporotrichum indicum Sporotrichum asteroides splendor Sporotrichum gougeroti Sporotrichum jeanselmei Sporotrichum lesnei Sporotrichum councilmani Sporotrichum bronchiali

TABLE I

CLASSIFICATION OF PARASITIC FUNGI FOUND IN BRONCHOMYCOSES

EUMYCETES

CLASS II: Ascomycetes Asci present, mycelium septate when present

	Family	*Genus*	*Species*
Order I: Saccharomycetales ..... Asci not gathered into definite perithecia	Saccharomycetaceae Rees No definite mycelium	Saccharomyces Meyen	Saccharomyces hominis Saccharomyces anginae
		Willia Hansen	Willia anomala Hansen
	Endomycetaceae Rees Vegetative cells form mycelium	Endomyces Rees	Endomyces bronchialis Castellani Endomyces pulmonalis Castellani
		Coccidioides Rixford and Gilchrist	Coccidioides immitis
Order II: Aspergillales Asci usually gathered into cylindric or globose perithecia	Aspergillaceae Small closed perithecia compact peridium	Penicillium Link	Penicillium crustaceum Penicillium glaucom Giordano Penicillium Bertai
		Aspergillus Micheli	Aspergillus fumigatus Aspergillus giganteus Aspergillus bronchialis
		Sterigmatocystis Cramer	Sterigmatocystis nidulans

CLASS III: Phycomycetes Mycelium continuous nonseptate in vegetative stage

Order I: Mucorales Several asexual spores in sporangium	Mucoraceae Asexual spores in typical sporangia; columella present	Mucor Micheli	Species mucor corymbifer
		Lichtheimia Vuillemin	Absidia Lichtheimi
		Rhizomucor Lucet and Constantin	Rhizomucor parasiticus
		Rhizopus Ehrenberg	Rhizopus nigricans

negative in smear and culture for any fungi whatever. All of the patients were preponderantly tuberculous; 295 of the entire group of 301 had repeatedly shown tubercle bacilli in their sputa. The remaining 6 patients consisted of 5 with bronchomycoses and 1 with a primary bronchiogenic carcinoma.

The fungi obtained from the 18 patients whose intratracheal saline aspirations revealed fungi constitute the material for this preliminary report. We shall briefly review the salient aspects of these cases, giving their case reports our interpretation of the fungi found, and attempt to classify them to the best of our ability. It is not our intention at this time to elaborate in detail upon the minutiae of their differential characteristics; this will be tried in a later article. However, microphotographs of the fungi and roentgenograms of the lungs of the patients will be presented now.

Tubercle bacilli were found in the sputum of all but 6 of the 301 patients. In these 6 the sputum was repeatedly negative for tuberculosis, but the oral and the tracheal sputum contained identical fungi. These 6 patients with sputum negative for tubercle bacilli and 12 others positive for tubercle bacilli form the 18 cases we are reporting. We know all these separate fungi were pathogenic because they were proved to produce, when injected into the lung tissues of rabbits, an infection from which the fungus was later recovered.

The insidiousness and latency of mycotic infections of the lungs causes the course of the disease to be quite similar to that of pulmonary tuberculosis. The spores, only, pass through the alveoli into the interstitial tissues, and produce tissue changes similar to those of tuberculosis. Hildebrandt[6] has described these changes as a defensive collection of tissue cells, lymphocytes, leucocytes and macrophages, which build up a wall around the fungi, not unlike tubercle formation in their immediate manifestations and subsequent sclerosing, connective tissue infiltrations. The clinical course of these invasions, as well as their physical and roentgenological findings, may make them indistinguishable from pulmonary tuberculosis, unless differentiated through the medium of culture and animal inoculations. Intradermal tests are of no differential value as they produce a skin reaction similar to that of a tuberculous infection.

Mary Lapham[7] in 1926 wrote "There are cases of aspergillosis on record which subsequently became tuberculous, and Renon says that this is a dangerous feature of the disease. While it is not generally believed that the development of tuberculosis is in any way associated with a disease so rare that it is a curiosity, how do we know that this disease is so infrequent?—would it be strange if such a disease should seriously complicate or even inhibit recovery in a case of tuberculosis?" She subsequently stated that when a case of tuberculosis is complicated by aspergillosis recovery seems more

TABLE II

PATHOGENIC FUNGI ISOLATED FROM TRACHEAL SECRETIONS IN 18 OF 301 PATIENTS WITH CHRONIC PULMONARY DISEASES

EUMYCETES

CLASS I: Fungi imperfecti—Subclass Hyphales (Hyphomycetes)

Order	*Suborder*	*Family*	*Genus*	*Species*
Thallosporales	Blastoporineae	Cryptococcoceae Kützing	Cryptococcus Kützing	cryptococcus hominis Vuillemin (4 cases)
		Oosporaceae Saccardo	Monilia Persoon	monilia Castellani (1 case)
				monilia bronchialis Castellani (1 case)
Conidiosporales	Sporotrichineae	Aleurismaceae	Sporotrichum Link	sporotrichum hominis (4 cases)

CLASS II: Ascomycetes

Saccharomycetales		Saccharomycetaceae Rees	Saccharomyces Meyen	saccharomyces hominis (4 cases)
Aspergillales		Aspergillaceae	Aspergillus Micheli	aspergillus fumigatus (3 cases)
			Sterigmatocystis Cramer	sterigmatocystis nidulans (1 case)

difficult and more unstable because there is a decided tendency to relapses. Also Castellani[8] reports some of these infections resemble tuberculosis clinically, and that the physical and the roentgenologic findings will not aid in differentiating them from tuberculosis.

It is apparent that the suspicion of the commensal relationship between fungous and tuberculous infections is not new. It is not our intention to attempt to prove any casual relationship, one way or the other. But we do suggest there may be a malign influence on the course of a tuberculous infection by the invasion of the lung tissue by fungi. The precautionary measures used in collection of the sputum and the isolation of fungi from the trachea in our cases lead us to believe there was a coexisting fungous invasion of the lungs in 12 of the 295 proved tuberculous patients in our series. It is to be remembered that in the other 6 patients tubercle bacilli were never found in their sputum, 5 of them were doubtless pure bronchomycoses, and 1 was affected with primary bronchiogenic carcinoma. Regarding the question of lung invasion in the 27 patients from whose tracheal washings no fungi were obtained, there is no way of knowing, and to conjecture is useless. Our failure to obtain the fungi from the sputum aspirated from the trachea suggests the possible fallacy of depending upon an examination of the mouth sputum alone, in substantiating a diagnosis of bronchomycoses. It is too well established that fungi may be purely saprophytic and are frequently ubiquitous.

In our series of 18 cases we found among the tuberculous the following species of fungi: 3 cryptococcus hominis Vuillemin, 1 monilia bronchialis, 4 saccharomyces hominis, 2 aspergillus fumigatis, 1 sterigmatocystis nidulans, 1 sporotrichum schencki; among the nontuberculous, 1 aspergillus fumigatis, 1 cryptococcus hominis Vuillemin, 3 sporotrichum schencki, 1 monilia Castellani. Their full classification is given in detail in Table II. The remaining 27 cases, embracing the ones in which fungi were obtained from the sputum only, and not from the trachea, showed the following genera: 2 cryptococcus Kützing, 1 monilia Persoon, 2 sporotrichum Link, 2 acremonium Link, 17 saccharomyces Meyen, and 2 aspergillus Micheli. There seems to be no available explanation at this time for the large percentage of patients with saccharomyces in their mouths, and yet so relatively absent in the trachea. It would seem, however, that the saccharomyces were not pathogenic to the same degree as the other fungi more constantly found in both sputum and trachea.

CASE REPORTS

Our cases may be briefly summarized as follows:

Case 1 (figures A and 1)—G. T., female, aged 27 years, white, single, stenographer, height 5 feet, 2 inches, weight 82 pounds. Duration of illness,

TABLE III

FUNGI FOUND IN SPUTUM OF 301 PATIENTS (295 TUBERCULOUS; 5 BRONCHOMYCOSES; 1 CARCINOMA OF BRONCHUS)

EUMYCETES

CLASS I: Fungi imperfecti—Subclass Hyphales (Hyphomycetes)

Order	*Suborder*	*Family*	*Genus*
Thallosporales	Blastosporineae	Cryptococcoceae Kützing	Cryptococcus Kützing (5 cases)
		Oosporaceae Saccardo	Monilia Persoon (4 cases)
Conidiosporales	Sporotrichineae	Aleurismaceae	Sporotrichum Link (6 cases)
			Acremonium Link (2 cases)

CLASS II: Ascomycetes

Saccharomycetales		Saccharomycetaceae Rees	Saccharomyces Meyen (21 cases)
Aspergillales		Aspergillaceae	Aspergillus Micheli (6 cases)
			Sterigmatocystis Cramer (1 case)

6 years. Diagnosis: chronic advanced fibro-ulcerative tuberculosis. Sputum positive for tubercle bacilli. Fungus isolated from trachea: saccharomyces hominis.

Case 2 (figures B and 2)—S. G., female, aged 18 years, white, single, domestic, height 5 feet, 6 inches, weight 116½ pounds. Duration of illness, 10 months. Diagnosis: chronic advanced fibroid pulmonary tuberculosis. Sputum positive for tubercle bacilli. Fungus isolated from trachea: cryptococcus hominis Vuillemin.

Case 3 (figures C and 3)—W. S., male, aged 29 years, white, single, clerk, height 5 feet, 11 inches, weight 118 pounds. Duration of illness, 1 year. Diagnosis: chronic pulmonary sporotrichosis. Sputum negative for tubercle bacilli. Fungus isolated from trachea: sporotrichum schencki.

Case 4 (figures D and 4)—H. G., male, aged 22 years, Mexican, single, laborer, height 5 feet, 6 inches, weight 112 pounds. Duration of illness, 8 years. Diagnosis: chronic advanced fibroid tuberculosis. Sputum positive for tubercle bacilli. Fungus isolated from trachea: sterigmatocystis nidulans.

Case 5 (figures E and 5)—O. V. R., female, aged 30 years, white, married, school teacher, height 5 feet, 4 inches, weight 132 pounds. Duration of illness, 5 years. Diagnosis: chronic pulmonary aspergillosis. Sputum negative for tubercle bacilli. Fungus isolated from trachea: aspergillus fumigatus.

Case 6 (figures E and 6)—O. C., female, aged 14 years, negress, single, school girl, height 4 feet, 9 inches, weight 105 pounds. Duration of illness, 1 year. Diagnosis: chronic fibro-ulcerative pulmonary tuberculosis. Sputum positive for tubercle bacilli. Fungus isolated from trachea: aspergillus fumigatus.

Case 7 (figures A and 7)—R. P. H., male, aged 24 years, negro, single, laborer, height 5 feet, 4 inches, weight 114 pounds. Duration of illness, 11 months. Diagnosis: chronic advanced fibroid tuberculosis with induced pneumothorax. Sputum positive for tubercle bacilli. Fungus isolated from trachea: saccharomyces hominis.

Case 8 (figures E and 8)—H. H., male, aged 24 years, negro, single, laborer, height 5 feet, 8 inches, weight 138 pounds. Duration of illness, 15 months. Diagnosis: chronic advanced fibroid pulmonary tuberculosis. Sputum positive for tubercle bacilli. Fungus isolated from trachea: aspergillus fumigatus.

Case 9 (figures B and 9)—J. H., male, aged 38 years, negro, married, laborer, height 5 feet, 6 inches, weight 108 pounds. Duration of illness, 5 months. Diagnosis: chronic advanced fibro-ulcerative pulmonary tuberculosis. Sputum positive for tubercle bacilli. Fungus isolated from trachea: cryptococcus hominis Vuillemin.

Case 10 (figures B and 10)—E. S., male, aged 64 years, negro, widower, laborer, height 5 feet, 11½ inches, weight 127 pounds. Duration of illness, 9 months. Diagnosis: chronic advanced fibroid pulmonary tuberculosis. Sputum positive for tubercle bacilli. Fungus isolated from trachea: cryptococcus hominis Vuillemin.

Case 11 (figures C and 11)—G. K., male, aged 29 years, white, single, laborer, height 5 feet, 4½ inches, weight 120 pounds. Duration of illness: 31 months. Diagnosis: chronic pulmonary sporotrichosis. Sputum negative for tubercle bacilli. Fungus isolated from trachea: sporotrichum schencki.

Case 12 (figures B and 12)—D. K., female, aged 34 years, white, married,

housewife, height 5 feet, 1¼ inches, weight 128 pounds. Duration of illness, 8 years. Diagnosis: chronic cryptococcus pulmonary mycosis. Sputum negative for tubercle bacilli. Fungus isolated from trachea: cryptococcus hominis Vuillemin.

Case 13 (figures C and 13)—G. J. C., male, aged 38 years, white, widower, newspaper man, height 5 feet, 11 inches, weight 116 pounds. Duration of illness, 6 weeks. Diagnosis: chronic advanced bilateral proliferative pulmonary tuberculosis. Sputum positive for tubercle bacilli. Fungus isolated from trachea: sporotrichum schencki.

Case 14 (figures A and 14)—J. J., male, aged 39 years, white, married, saw-filer, height 5 feet, 4½ inches, weight 109 pounds. Duration of illness, 6 years. Diagnosis: chronic advanced fibro-ulcerative pulmonary tuberculosis, with fluid in left pleural cavity. Sputum positive for tubercle bacilli. Fungus isolated from trachea: saccharomyces hominis.

Case 15 (figures C and 15)—A. S., male, aged 66 years, white, married, mail clerk, height 5 feet, 4½ inches, weight 116 pounds. Duration of illness, 15 years. Diagnosis: chronic pulmonary sporotrichosis. Sputum negative for tubercle bacilli. Fungus isolated from trachea: sporotrichum schencki.

Case 16 (figures A and 16)—H. H., male, aged 55 years, white, married grocery clerk, height 5 feet, weight 110 pounds. Duration of illness, 9 months. Diagnosis: chronic advanced bilateral fibro-ulcerative pulmonary tuberculosis. Sputum positive for tubercle bacilli. Fungus isolated from trachea: saccharomyces hominis.

Case 17 (figures F and 17)—H. G., male, aged 29 years, Mexican, married, laborer, height 5 feet, 4 inches, weight 92 pounds. Duration of illness, 13 months. Diagnosis: chronic advanced fibro-ulcerative pulmonary tuberculosis. Sputum positive for tubercle bacilli. Fungus isolated from trachea: monilia bronchialis Castellani.

Case 18 (figures F and 18)—S. C., male, aged 59 years, Hebrew, married, peddler, height 5 feet, 4 inches, weight 165 pounds. Duration of illness, 8 months. Diagnosis: primary bronchiogenic carcinoma (proved by removal of tissue through pronchoscope). Sputum negative for tubercle bacilli. Fungus isolated from trachea: monilia Castellani.

DISCUSSION

It was our main purpose in this investigation to determine the presence of fungi in the sputum of tuberculous patients, and their pathogenicity in inoculated rabbits. We hoped by carefully aspirating the sputum from the trachea to guard against the possibility of the fungi, so isolated, being just contaminants from the nose or oral cavity. Furthermore, we hoped that the fact we might recover these fungi from the lungs of inoculated rabbits would render the possibility less likely of their being harmless to the patient. We were able to produce pulmonary lesions, both localized and generalized, by injecting some of each of the cultures into rabbits' lungs, and to recover the identical inoculated fungus after the autopsy from all of the 18 rabbits injected. It was decided that the 27 cases, in whom fungi were found in the mouth sputum but not in the tracheal sputum, should be excluded from our investigation, as the likeli-

hood of such fungi being contaminants was too great for them to deserve serious consideration here. Naturally, we have no way of knowing whether some, or many, of the fungi classed by us as saprophytic and non-pathogenic, might also have been present in the trachea, but not revealed in our cultures. The exclusion of the latter series should strengthen the supposition that fungi may be found in the trachea in at least 6 per cent of patients affected with pulmonary diseases.

Approximately 50 per cent of the fungi (in 21 of the 45 patients) found in the mouth sputum were saccharomyces hominis, yet this fungus was isolated from the trachea in only 4 of them. In contrast we found that when other species, such as aspergillus fumigatus, sterigmatocystis nidulans, sporotrichum schencki, cryptococcus Vuillemin and monilia, were found in the mouth sputum, the same fungus was isolated from the trachea in 63.5 per cent of them. This is an interesting observation in that it suggests that the finding of the latter fungi in the oral sputum more strongly indicates its presence in the trachea, also, than is the case when saccharomyces are known to be present in the mouth secretions. Saccharomyces are more likely, perhaps, to be saprophytic.

Symbiosis—In none of our cases were two different fungi found in our cultures, although it is known that they are frequently found together as saprophytes, and that a number of species are capable of living in symbiosis. We can only conjecture whether in our patients the tubercle bacilli and the coexisting fungi were living in an association detrimental to the patient, and, also, naturally beneficial to themselves. Castellani[2] states that symbiosis, both sensu lato and sensu stricto, has been frequently observed by botanists, and that there are certain diseases which are, in all probability, caused by the symbiosis of two vegetal organisms, such as a fungus and a bacterium; for instance, Trichomycosis nigra and Trichomycosis rubra. All of our patients from whose tracheal aspirations the fungi were taken were in advanced stages of tuberculosis. It is possible there may have been some symbiotic relationship between the tuberculous infection and the fungous invasion in at least 12 of these patients, and that this association may have resulted in a more aggravated, serious disease. In 8 of our 12 tuberculous patients, the average duration of time since the onset of their primary symptoms of sickness was just 9.6 months. However, even in this short period, their pulmonary changes were far advanced. There were only 4 patients in whom the tuberculosis lasted long enough for us to expect it to produce such extensive pulmonary lesions as we encountered in the entire group. The probability of such symbiotic relationship is great enough for us to suggest further investigation along this line.

SUMMARY

An investigation was instituted to determine the incidence of fungi in the oral sputum of 301 patients residing principally in the Houston Tuberculosis Hospital. In 45 (15 per cent) of these 301 patients, fungi were primarily isolated from the oral sputum by direct smear and by culture in Sabauraud's dextrose medium; in 18 cases (6 per cent), fungi individually identical with the ones found in the sputum were isolated by carefully controlled washing of the trachea. These latter 18 patients were selected for an intensive study, which will be reported subsequently in greater and more minute detail, as this paper is intended only for a general survey of the salient features of our work.

We believe, however, we are justified in the following conclusions:

1) Parasitic fungi may be found in the tracheal sputum of at least 4 per cent of tuberculous patients;

2) The finding of fungi in the mouth sputum alone does not assure their presence, also, in the trachea; and, therefore, by inference, in the bronchi and lungs;

3) In 60 per cent of patients the finding of fungi in sputum from the mouth alone may indicate only the presence of saprophytic, harmless contaminants;

4) Fungi obtained from the trachea and cultured on Sabauraud's dextrose medium will produce, when injected into the lungs of rabbits, localized and generalized lesions in their lungs, from which the same fungi may be obtained;

5) There seems to be a tendency for the pulmonary tuberculosis to develop a more devastating course when it is associated with an invasion of parasitic fungi;

6) The coexistence of fungous and tuberculous infections should be more frequently considered in the diagnosis of chronic pulmonary diseases.

RESUMEN

Se inició una investigación para determinar la frecuencia con que aparecían hongos en el esputo bucal de 301 enfermos residentes principalmente en el Hospital para Tuberculosis de Houston, Texas. En 45 (15 por ciento) de estos 301 enfermos, se aislaron hongos primordialmente del esputo bucal mediante el examen del frote directo y cultivo en el medio de glucosa de Sabauraud; en 18 casos (6 por ciento) se aislaron hongos individualmente idénticos a los que se encontraron en el esputo, por medio de lavado de la tráquea cuidadosamente controlado. Se escogió a estos 18 últimos enfermos para un estudio intensivo que se comunicará subsiguientemente en más extenso y minucioso detalle, ya que el presente informe sólo tiene

como objeto la presentación de un bosquejo general de los aspectos más salientes de nuestra investigación.

Sin embargo, creemos estar justificados al formular las siguientes conclusiones:

1) Se puede hallar hongos parasíticos en el esputo traqueal en, por lo menos, el 4 por ciento de los enfermos tuberculosos;

2) El hallazgo de hongos solamente en el esputo de la boca no da la certeza de que estén presentes también en la tráquea y, por consiguiente, por inferencia, en los bronquios y en los pulmones;

3) En el 60 por ciento de los enfermos el hallazgo de hongos solamente en el esputo de la boca puede indicar únicamente la presencia de innocuos contaminadores saprofíticos;

4) Hongos obtenidos de la tráquea y cultivados en el medio de glucosa de Sabauraud causan, cuando se inyectan en los pulmones de conejos, lesiones pulmonares localizadas y generalizadas de las cuales se puede obtener estos mismos hongos;

5) Parece que la tuberculosis pulmonar tiende a desplegar una evolución más devastadora cuando está acompañada de una invasión de hongos parasíticos;

6) La coexistencia de infecciones fungosas y tuberculosas se debe tener en cuenta con más frecuencia en el diagnóstico de enfermedades pulmonares crónicas.

DESCRIPTIONS OF ROENTGENOGRAMS OF PATIENTS' LUNGS

Case 1—G. T. The chest cage is barrel shaped, with wide intercostal spaces. Throughout both lungs dense snowflake like infiltrations particularly evident in the right base, and to a lesser extent in the left upper lobe are noted. Small cavities are noted in the upper lobes and one large cavity, approximately 2½ x 3 cm., in the right upper lobe at the level of the third interspace anteriorly. There is a localized pneumothorax at the top of the right lung.

Case 2—S. G. The chest cage is long and narrow. Considerable widening of the hilus area. The right upper lobe is densely infiltrated and in the upper outer portion a rather large cavitation. There are long strands of bronchial and peribronchial thickening peripherally from the hilus area throughout both lungs, particularly noted in the right basal area.

Case 3—W. C. The chest cage is large with wide intercostal space. The markings are increased throughout both lungs, both basally and apically and especially in the right lung and bilaterally a fair number of discrete calcifications, especially on the right side. The hiluses are definitely increased.

Case 4—H. G. The chest cage is somewhat wide with wide intercostal spaces. The hilus areas are quite large particularly on the left side. The left upper lobe is infiltrated in its entirety with dense

shadows extending from the hilus areas peripherally and within the interstices are noted a number of calcifications. The right upper lobe has a dense involvement throughout of like character as in the left upper lobe.

Case 5—O. V. R. The chest is barrel shaped with wide intercostal spaces. Hiluses are considerably enlarged with large calcifications therein. The markings throughout both lungs are considerably increased, the basal shadows being more distinct than the apical ones. Throughout both lungs there are a number of fine, snowflake-type nodulations.

Case 6—O. C. The chest cage is normal in size and contour. The hiluses are generally increased. The heart is pulled toward the right. The right upper lobe is densely infiltrated with a fleecy, nodular mass of shadows which extend into the middle lobe and the upper part of the right lower lobe. There is a medium sized cavity in the middle of the right upper lobe and a fleecy shadow infiltrating the upper portion of the left upper lobe.

Case 7—R. P. H. The chest cage is large with wide intercostal spaces. The left lung is partially compressed from an induced pneumothorax, showing adhesions to the left upper lobe, and a large uncollapsed cavity in the left upper lobe. Almost the entire right lung is infiltrated with a nodular, fleecy mass of shadows, particularly dense in the middle of the right lung, extending peripherally from the hilus area.

Case 8—H. H. The chest cage is normal in size and contour. The hilus shadows are very dense and wide bilaterally. There is a tremendous amount of peribronchial thickening throughout, particularly in the right upper lobe.

Case 9—J. H. The chest cage is barrel shaped with wide intercostal spaces. The left lung reveals a partial, induced pneumothorax, with the uncollapsed lung showing dense infiltration throughout, and a collection of fluid from the second interspace to the third interspace anteriorly. There is a moderate amount of fluid to be noted at the base of the left lung. The right upper lobe is moderately infiltrated, but the right middle lobe shows a dense conglomeration of parenchymal shadows.

Case 10—E. S. The chest cage is long and narrow. The right upper lobe is considerably infiltrated, with dense peribronchial markings extending from the hiluses to the periphery. Both basal areas show a similar type of infiltration throughout.

Case 11—G. K. The chest cage is normal in size and contour. The hiluses are considerably increased. There is a marked generalized peribronchial thickening extending from the hiluses peripherally to the pleural margins. The basal shadows are more distinct than the apical ones.

Case 12—D. K. C. (After lipiodol injection into the bronchi.) The chest cage is normal in size and contour. The hilus shadows are moderately increased. The peribronchial markings are generally increased, particularly basally and especially in the left lower lobe.

Case 13—G. J. C. The chest cage is large with wide intercostal spaces. The hilus areas are generally increased. The lungs, generally, bilaterally, are infiltrated with nodular, fleecy shadows throughout except in the left base.

Case 14—J. J. The chest cage is normal in size and contour. The right upper lobe is infiltrated with dense peribronchial and parenchymal markings, with a large cavity in the middle of the lobe. The right middle and right lower lobes show a similar infiltration but to a lesser degree. The left lung shows a dense homogeneous shadow throughout, except for the central portion of the left upper lobe wherein there is a rounded area of aerated compressed lung.

Case 15—A. S. (After injection of lipiodol into the bronchi.) The chest cage is long and narrow. The hiluses are moderately increased. The bronchi are generally increased, particularly in the bases.

Case 16—H. H. The chest cage is barrel shaped with wide intercostal spaces. The hilus shadows are generally increased, particularly on the right side. The right middle lobe is densely infiltrated throughout with two cavitations noted, and the markings are considerably increased in the right upper lobe. There is a moderate amount of infiltration of the left upper lobe. There are a number of large calcifications in both lungs, especially in the lower portion of the right upper lobe, and in the left hilus area, the outer portion of the left upper lobe, and just above the centre of the left diaphragm.

Case 17—H. G. The chest is normal in size and contour. The hilus areas are tremendously increased. Throughout the right lung there is a generalized fleecy, snowflake appearance, and in the uppermost portion a number of small conglomerate cavitations are noted. The right diaphragm is somewhat high and irregular. The lower portion of the left upper lobe and the left lower lobe are likewise infiltrated with the same type of involvement as in the right lung.

Case 18—S. C. The chest cage is wide and short. The tracheal shadow is slightly deviated to the left, and the aortic knob is quite prominent to the left. The left base shows a dense homogeneous shadow, somewhat concave in its uppermost portion, above which is to be noted a densely infiltrated arched shadow. The markings throughout the left upper lobe are slightly increased and throughout the right lung, particularly in the right middle and lower lobes the bronchi are densely thickened.

Figure A—Saccharomyces hominis (4 cases) Class Ascomycetes. Description: Round or ovoid cells; cell wall, single contour. Occa-

sionally a rudimentary mycelium with transverse septation. Reproduced by budding. Remark: Fungi of this genus, as well as the genera of Cryptococcus, Monilia, Oidium and Coccidiodes are often called Blastomycetes, and the diseases induced by them blastomycoses.

Figure B—Cryptococcus hominis Viullemin (4 cases) Class F. Imperfecti. Description: Rounded budding cells (single bud at times), double contour, no mycelium, no asci.

Figure C—Sporotrichum schencki (4 cases) Class F. Imperfecti. Description: Pear-shaped conidia arising directly from the mycelium, conidia arising laterally and at the tips of the filaments, from all parts of the mycelium. Remark: Perhaps most serious fungus.

Figure D-1—Sterigmatocystis nidulans (1 case).

Figure D-2—Sterigmatocystis nidulans. Class Ascomycetes. Family aspergillaceae. Description: Conidiophores terminating in roundish formations, on which are situated short cylindrical structures, surmounted by similar elements, which support a chain of roundish conidia.

Figure E—Aspergillus fumigatus. Description: Small sessile closed perithecia; compact peridium. Class Ascomycetes. Family aspergillaceae.

Figure F—Monilia. Class F. Imperfecti. Description: Showing budding forms and mycelial threads which are long and branched.

The Greer Clinic.

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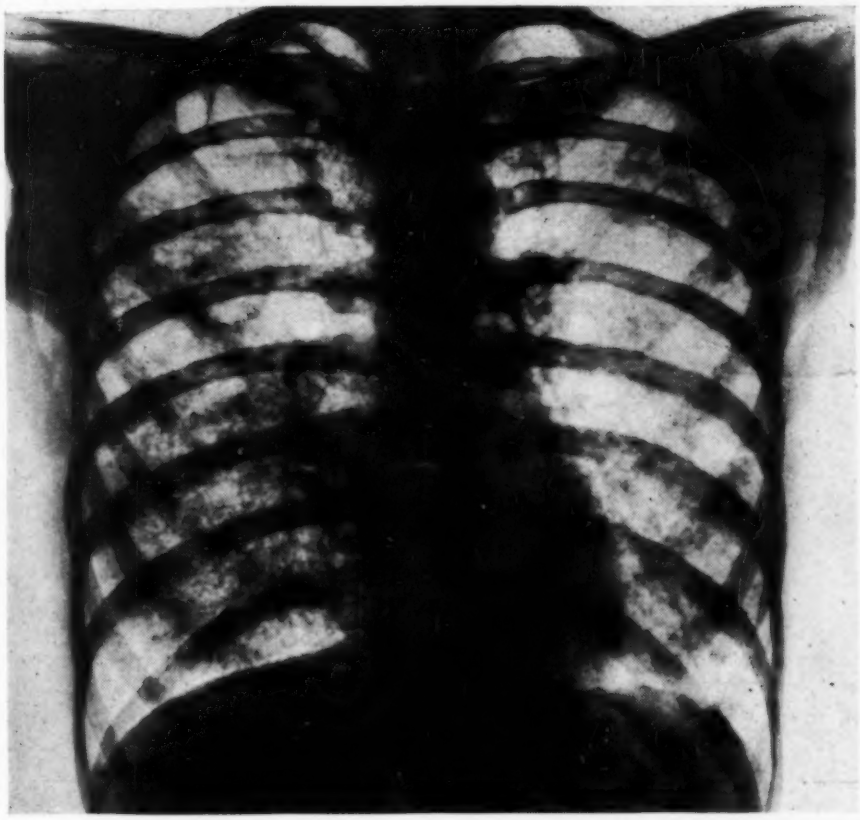
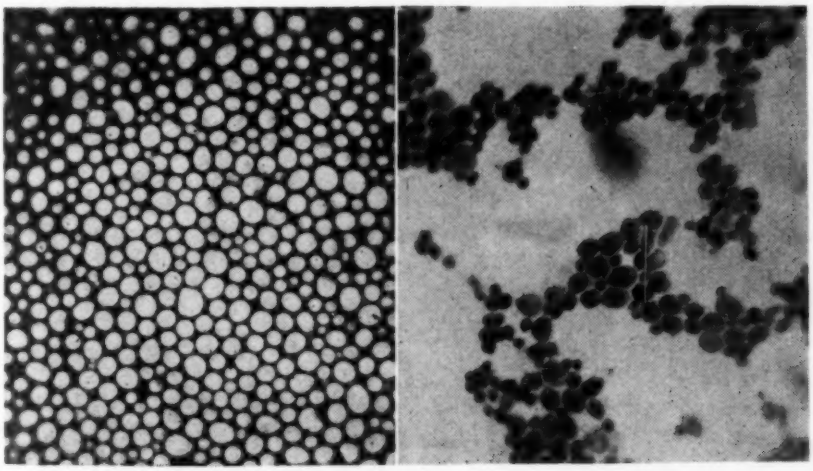


Fig. 1—Roentgenogram of Case 1. Chronic fibro-ulcerative pulmonary tuberculosis. Fungus: saccharomyces hominis Vuillemin.



(1) Fig. A (2)

(1) Sacharomyces hominis; cases 1, 7, 14, 16. (2) Photomicrograph of saccharomyces hominis; cases 1, 7, 14, 16.

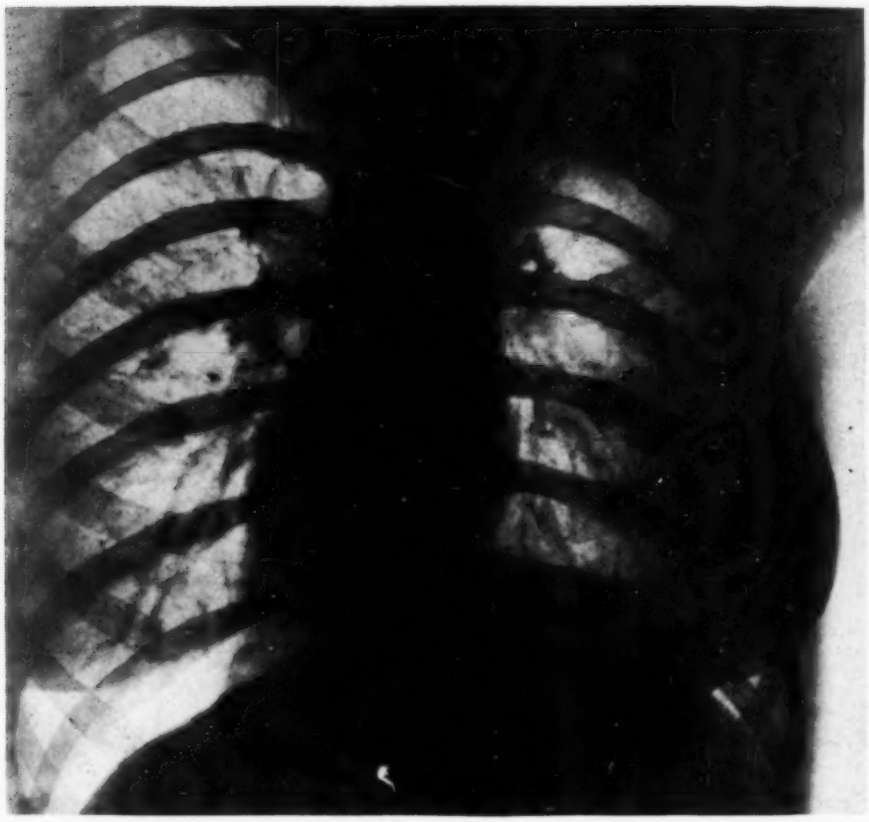
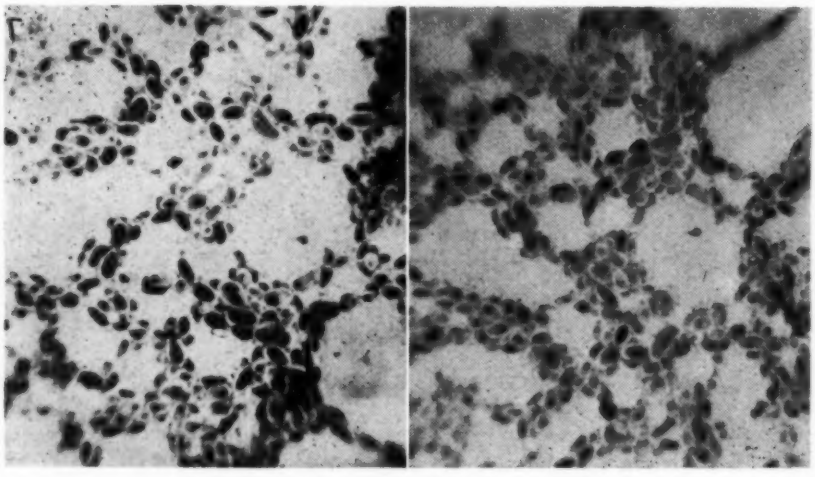


Fig. 2—Roentgenogram of Case 2. Chronic advanced fibroid tuberculosis. Fungus: cryptococcus hominis Vuillemin.



(1) Fig. B (2)

(1) Cryptococcus hominis Vuillemin; cases 2, 9, 10, 12. (2) Photomicrograph of cryptococcus hominis Vuillemin; cases 2, 9, 10, 12.

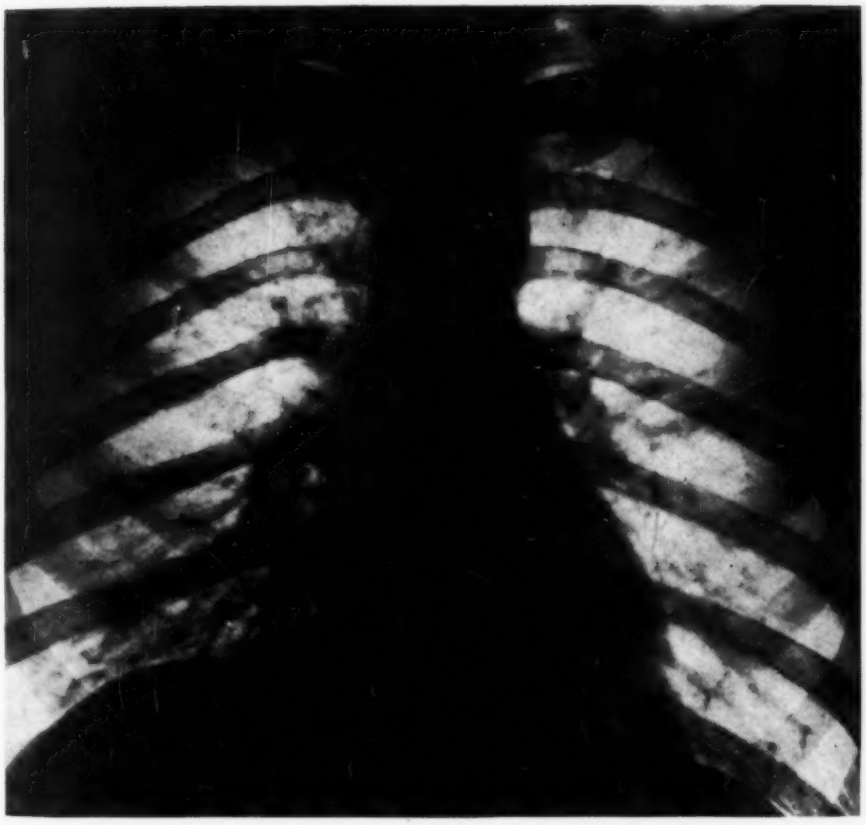
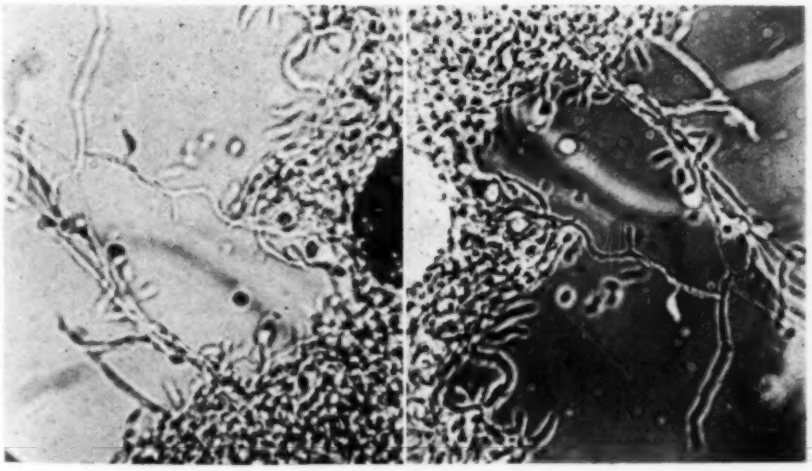


Fig. 3—Roentgenogram of Case 3. Chronic pulmonary sporotrichosis. Fungus: sporotrichum schencki.



(1) Fig. C (2)

(1) Photomicrograph of sporotrichum schencki; cases 3, 11, 13, 15. (2) Sporotrichum schencki; cases 3, 11, 13, 15.

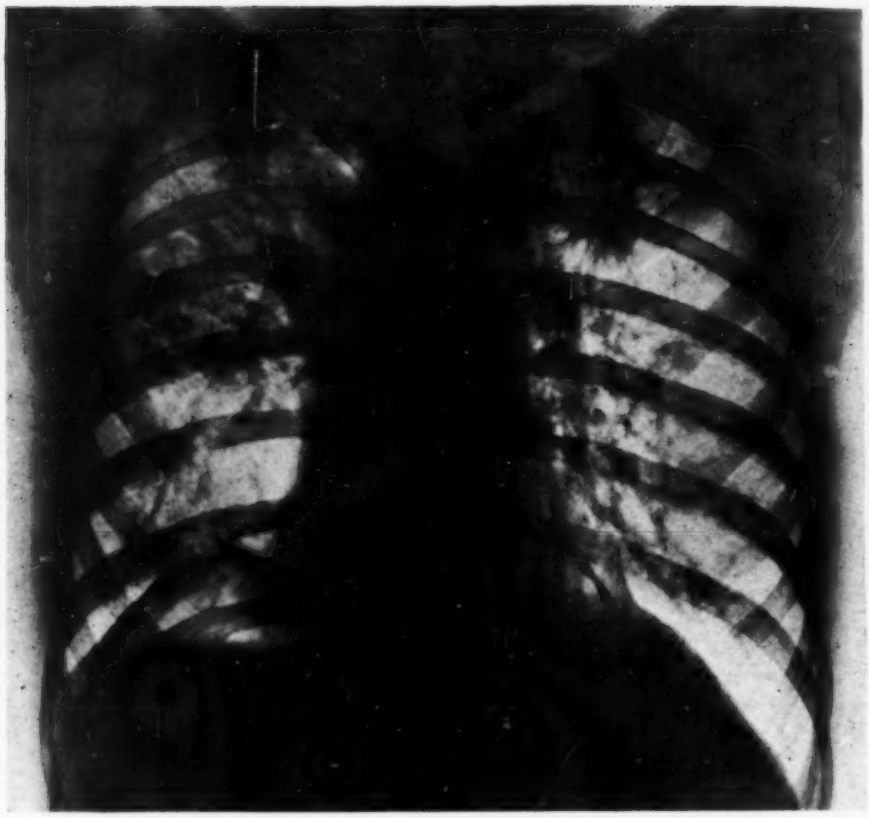
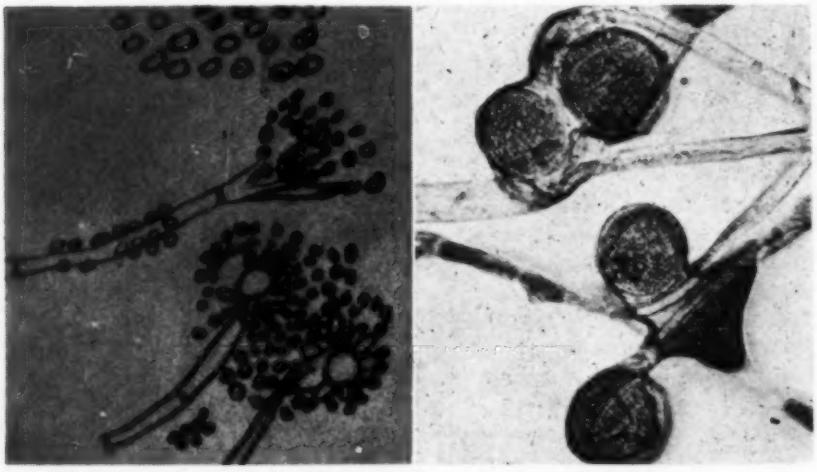


Fig. 4—Roentgenogram of Case 4. Chronic advanced fibroid pulmonary tuberculosis. Fungus: sterigmatocystis nidulans.



(1) Fig. D (2)

(1) Sketch of Sterigmatocystis nidulans; case 4. (2) Photomicrograph of sterigmatocystis nidulans; case 4.

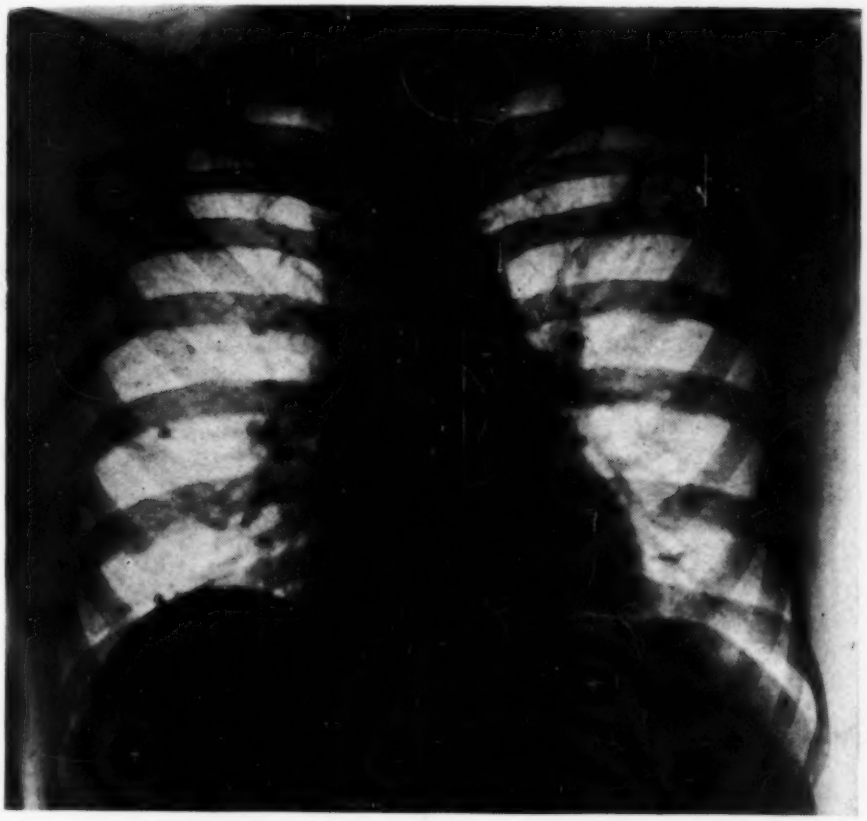
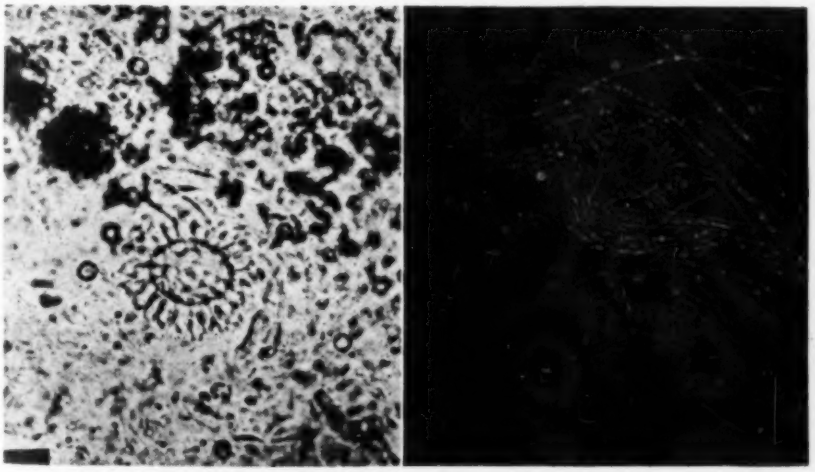


Fig. 5—Roentgenogram of Case 5. Chronic pulmonary aspergillosis. Fungus: aspergillus fumigatus.



(1) Fig. E (2)

(1) Aspergillus fumigatus; cases 5, 6, 8. (2) Photomicrograph of aspergillus fumigatus; cases 5, 6, 8.

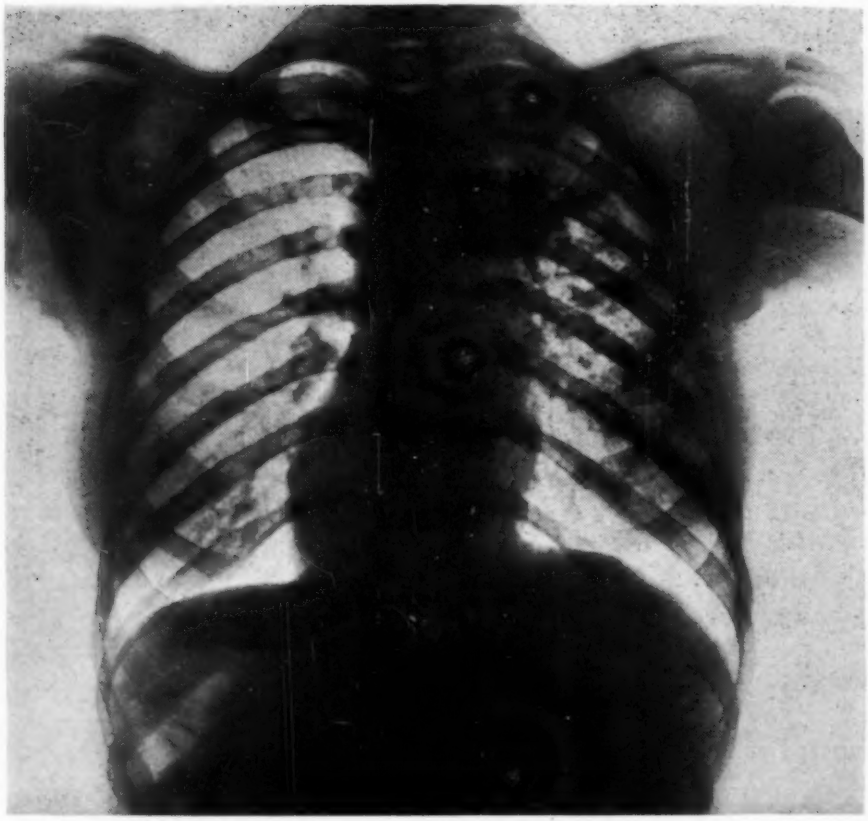
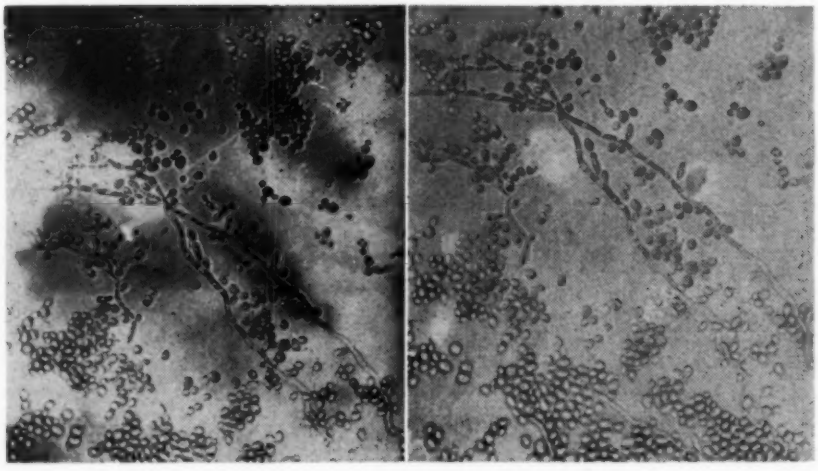


Fig. 6—Roentgenogram of Case 6. Chronic advanced pulmonary tuberculosis. Fungus: aspergillus fumigatus.



(1) Fig. F (2)

(1) Monilia; cases 17, 18. (2) Photomicrograph of Monilia; cases 17, 18.

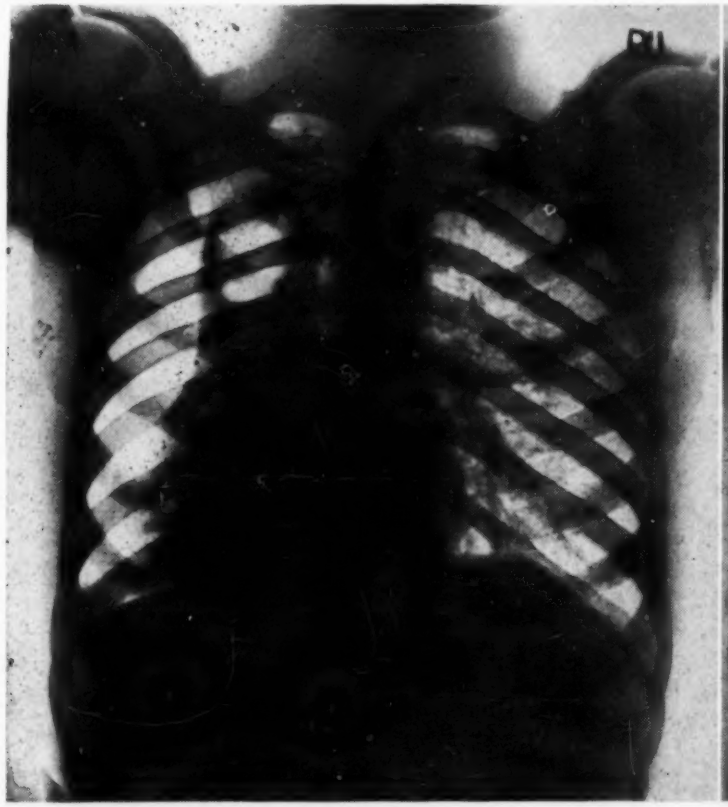


Fig. 7

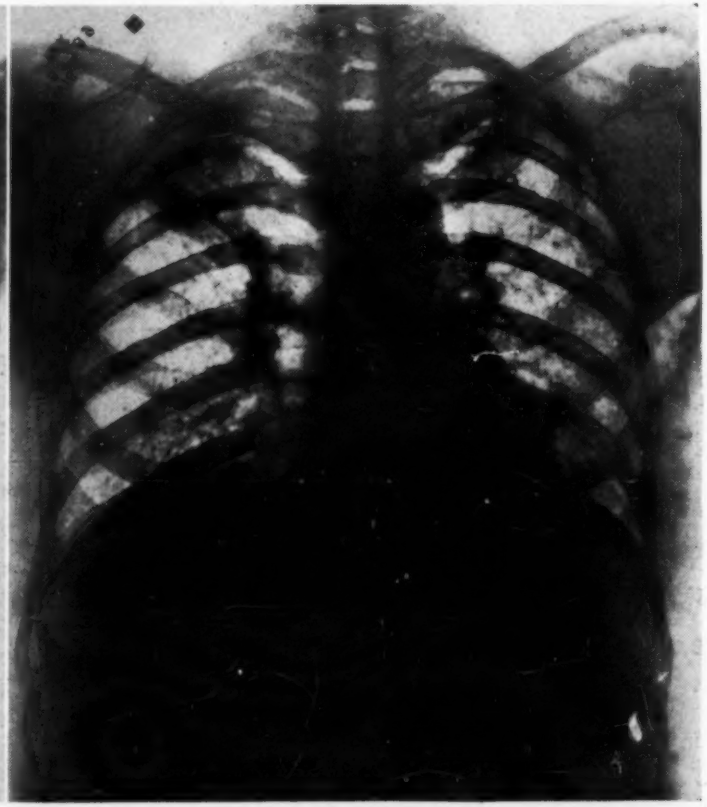


Fig. 8

Fig. 7—Roentgenogram of Case 7. Chronic advanced fibroid pulmonary tuberculosis with induced pneumothorax. Fungus: saccharomyces hominis. *Fig. 8*—Roentgenogram of Case 8. Chronic advanced fibroid pulmonary tuberculosis. Fungus: aspergillus fumigatus.

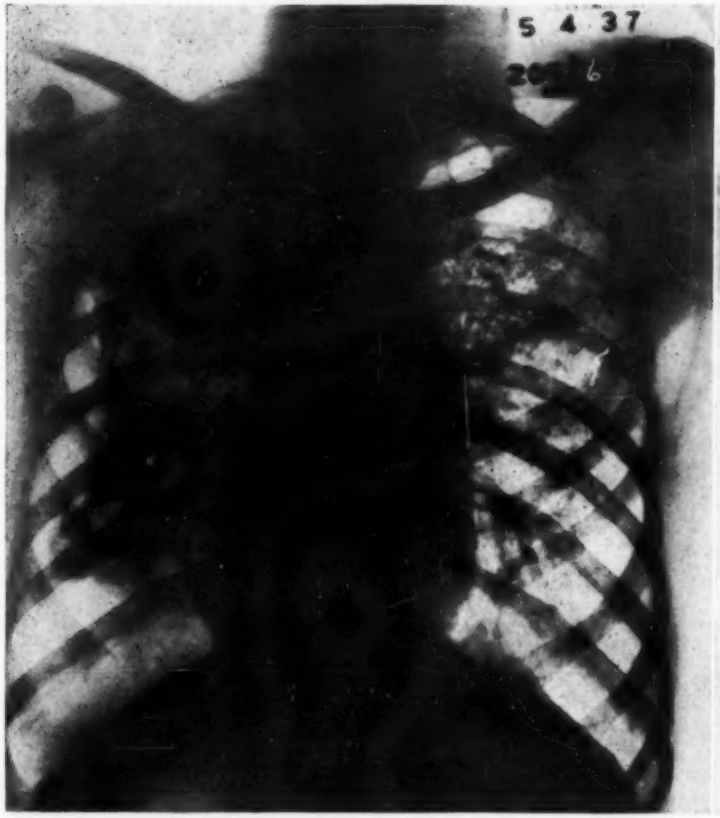


Fig. 9

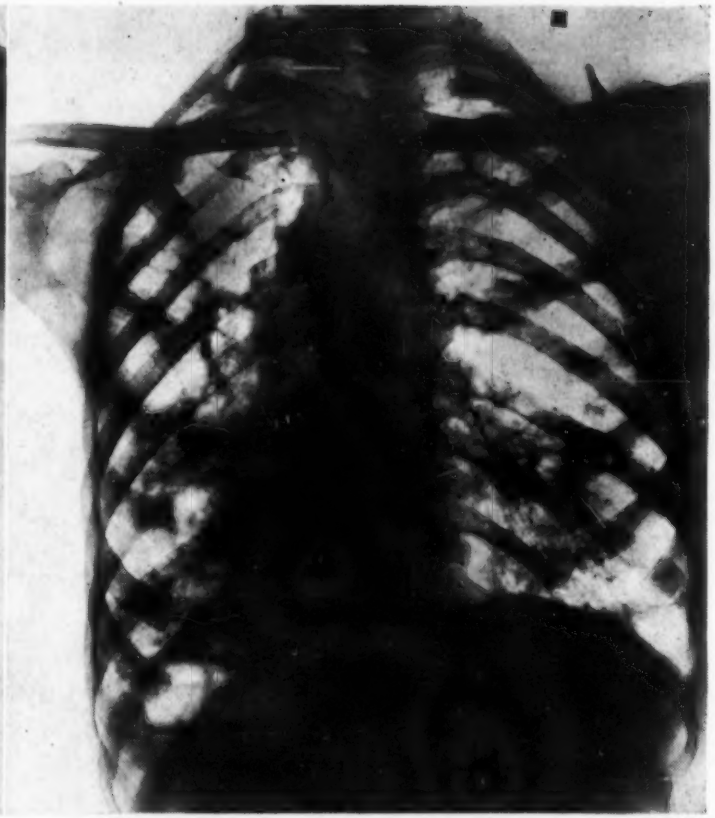


Fig. 10

Fig. 9—Roentgenogram of Case 9. Chronic advanced fibro-ulcerative pulmonary tuberculosis. Fungus: cryptococcus hominis Vuillemin. *Fig. 10*—Roentgenogram of Case 10. Chronic advanced fibroid pulmonary tuberculosis. Fungus: cryptococcus hominis Vuillemin.

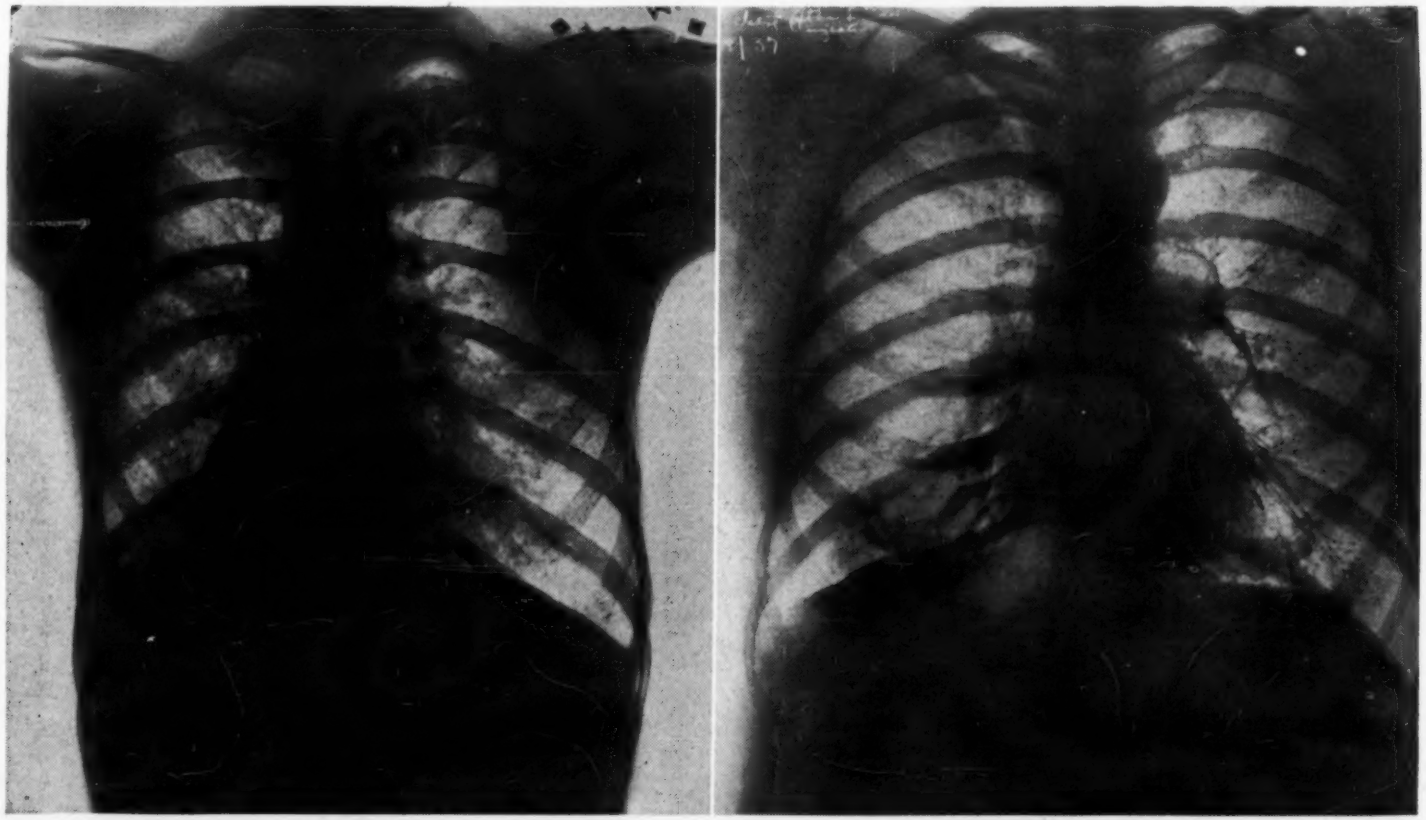


Fig. 11 Fig. 12

Fig. 11—Roentgenogram of Case 11. Chronic pulmonary sporotrichosis. Fungus: sporotrichum schencki. *Fig. 12*—Roentgenogram of Case 12. Chronic cryptococcus pulmonary mycosis. Fungus: cryptococcus hominis Vuillemin.

Fig. 13

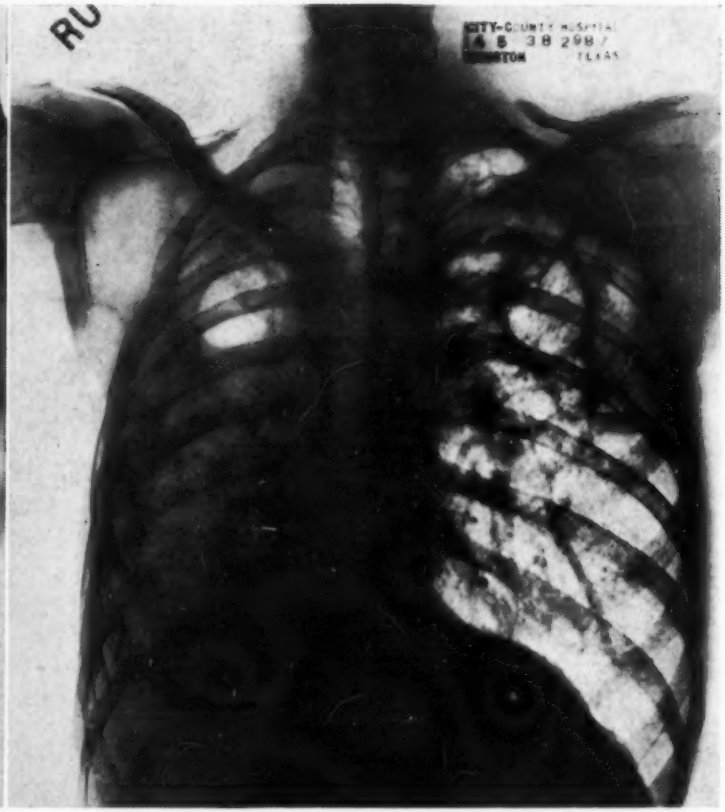


Fig. 14

Fig. 13—Roentgenogram of Case 13. Chronic advanced proliferative pulmonary tuberculosis. Fungus: sporotrichum schencki.
Fig. 14—Roentgenogram of Case 14. Chronic advanced fibro-ulcerative pulmonary tuberculosis. Fungus: saccharomyces hominis.

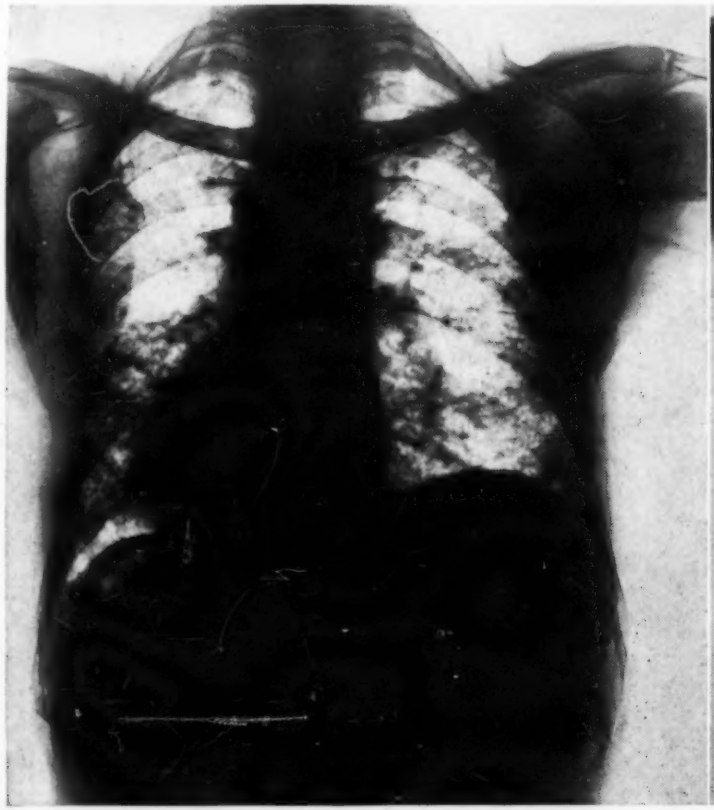


Fig. 15

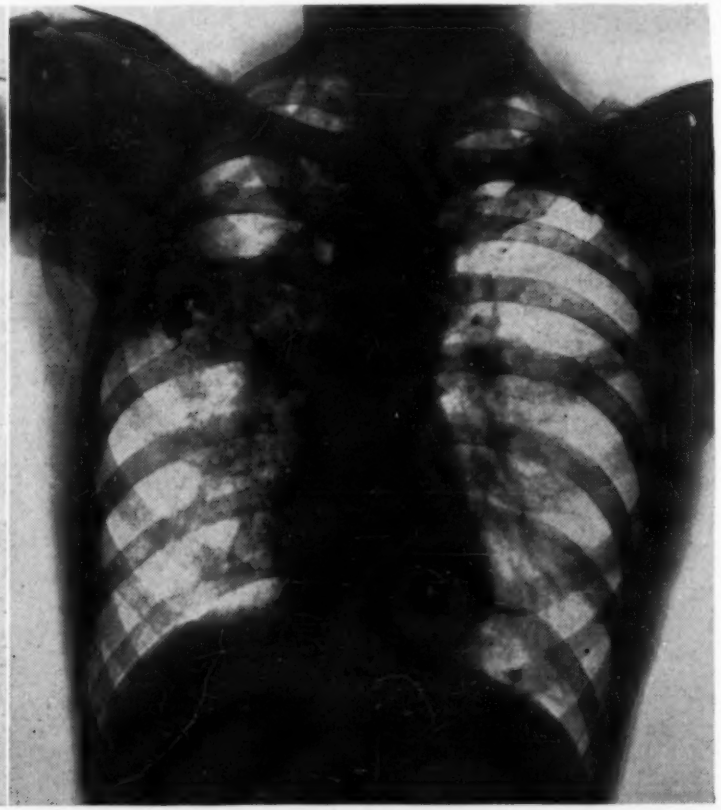


Fig. 16

Fig. 15—Roentgenogram of Case 15. Chronic pulmonary sporotrichosis. Fungus: sporotrichum schencki. *Fig. 16*—Roentgenogram of Case 16. Chronic advanced fibro-ulcerative pulmonary tuberculosis. Fungus: saccharomyces hominis.

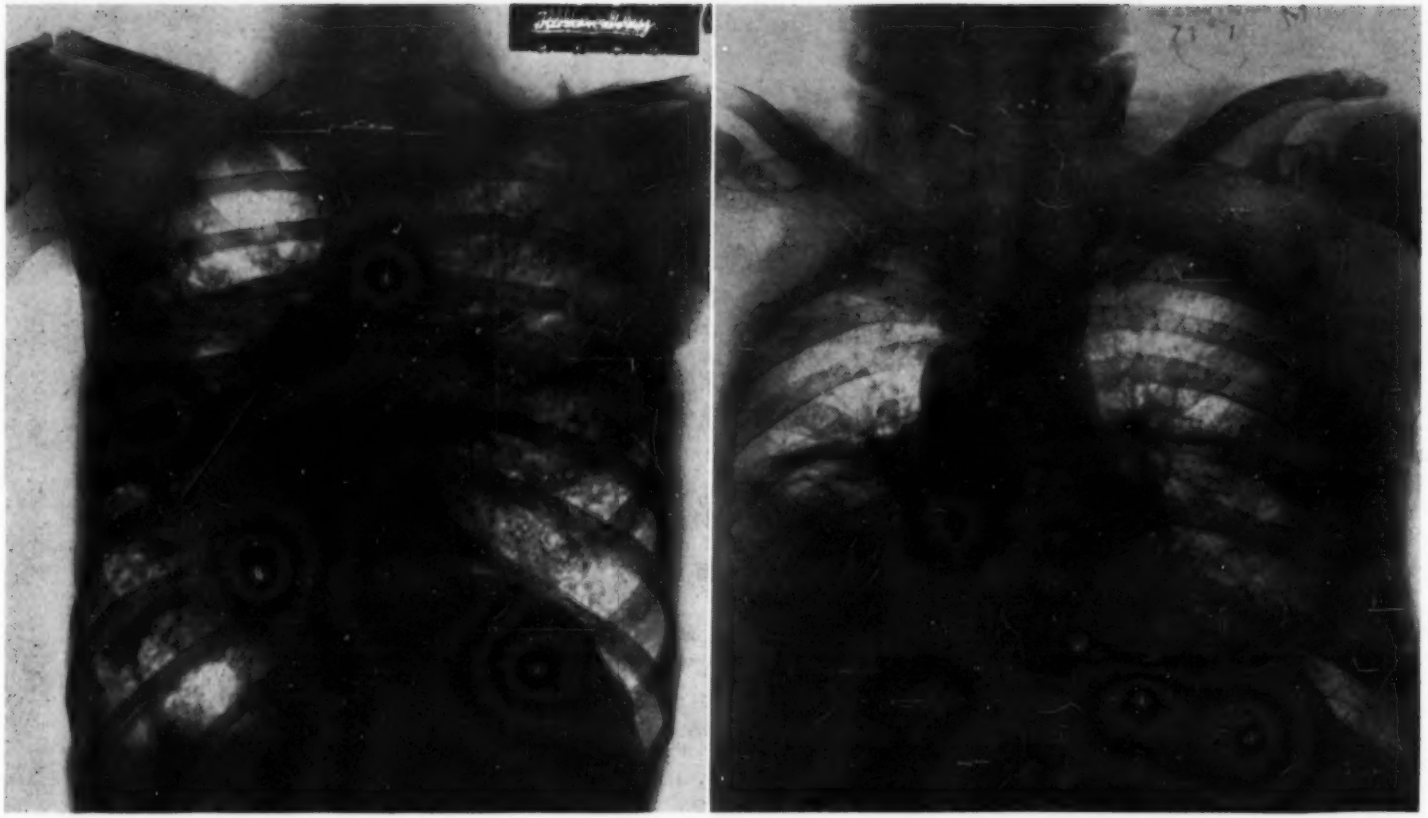


Fig. 17 Fig. 18

Fig. 17—Roentgenogram of Case 17. Chronic advanced fibro-ulcerative pulmonary tuberculosis. Fungus: monilia bronchialis Castellani. *Fig. 18*—Roentgenogram of Case 18. Primary bronchiogenic carcinoma. Fungus: monilia Castellani.

A Study of the Weltmann Coagulation Reaction in Pulmonary Tuberculosis

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Phthisiologists have always hoped for a specific or non-specific serological reaction as an aid in the diagnosis and prognosis of tuberculosis. Many have been brought forth, but as little clinical assistance could be gained from these methods, most of them have been discarded.

In 1930 Weltmann[1] introduced his serum coagulation reaction. He noted that when normal human serum is diluted fifty times in a solution of $CaCl_2$:6 H_2O (hydrated calcium chloride) and heated in a boiling water bath, it will not coagulate if the concentration of the $CaCl_3$ is less than 0.04 per cent. He observed that diseases associated with exudative changes require a greater concentration of $CaCl_2$ to produce coagulation as compared with diseases associated with fibrotic changes. He concluded that this serum coagulation reaction was not specific for any disease, but that it distinguished exudative from fibrotic changes in the body.

Technique—This test is simple to perform and requires very little apparatus. The results can be determined 20 to 25 minutes after the serum has been obtained. From a stock solution of 10 per cent calcium chloride ($CaCl_2$:6 H_2O) ten dilutions are made up, varying from 0.1 per cent to 0.01 per cent. Five cc. of each dilution is pipetted into each of ten tubes. Ordinary test tubes may be used, and the tubes are numbered from 1 to 10, beginning with the strongest dilution. Into each tube is pipetted 0.1 cc. of the unhemolyzed serum to be tested. The contents are mixed thoroughly and the tubes placed in a boiling water bath for fifteen minutes. They are then removed, and the test is read. The contents of the tubes may be clear, faintly opalescent, turbid, or there may be flocculation. The number of tubes in which flocculation occurs determines the coagulation band of the serum tested. The normal band is 6 to 6½. Weltmann stated that if the coagulation band was less than 6, the reaction showed a shift to the left; and when it was 7 or more, a shift to the right. Though the chemical or physio-chemical mechanism of the coagulation band is not known, the band forms according to whether the exudative or productive tissue changes predominate.

Makitra,[2] Voigtlander,[3] Kretz,[4] Dissmann,[5] and other European

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investigators came to the same conclusion as Weltmann on his coagulation test. These workers, in studying large series of tuberculous cases, concluded that this test was of value in the diagnosis and prognosis of tuberculosis. Dissmann stated that in the presence of fibrocaseous tuberculosis the Weltmann test frequently gave a normal band. A shift to the right was noted only in purely productive lesions, in closed cavity cases, and in those whose lesions were in a state of healing. Levinson and Klein,[6,7] the only American investigators to study the Weltmann reaction, carried out this test in a large group of tuberculous cases. They also compared it with the sedimentation rate. They concluded that the test is of importance because it can be used as a guide in the prognosis of the disease. There was no definite correlation between the Weltmann reaction and the sedimentation rate. The former seemed to be a better index to the clinical state of the patient.

The present investigation was undertaken in order to determine the possible value of routine Weltmann serum reactions in phthisical subjects, with special reference to prognosis, and to compare it with other laboratory procedures.

The total number of patients studied was 232, and their average length of residence in the sanatorium varied from three to six months.

Of the 232 cases of pulmonary tuberculosis studied, 21 were minimal, 19 moderately advanced, and 192 far advanced. Hemograms, sedimentation rates, sputum examinations and Weltmann serum reactions were made at monthly intervals, or oftener when indicated. Roentgenograms of the chest were made at two and three month intervals.

In the group with minimal involvement the Weltmann coagulation band and sedimentation rate were of no value as a guide in the clinical course. All of this group were asymptomatic on admission, and the x-rays revealed minimal fibrotic infraclavicular lesions and apical infiltrations. The sputum was negative for tubercle bacilli. The coagulation band was 6½ to 7, and the sedimentation rate was normal and remained so. Though later two cases showed clinical signs of activity and developed positive sputum, the Weltmann reaction remained normal. Serial x-rays of the chest showed early cavitation in one case, and increased productive infiltration in the other.

Four of the moderately advanced cases were apparently arrested, and the Weltmann reaction accurately reflected the clinical progress. Fifteen of the cases of this group had tubercle bacilli in their sputum. Their coagulation band ranged between 6 and 9, and did not correlate with the clinical course of the disease, while the sedimentation rate did.

One hundred ninety-two cases were far advanced; and of this number, 134 could be classified as good chronics, while the remaining 58 were terminal cases. Tubercle bacilli were always present in the sputum of this group. The coagulation band usually showed a shift to the right, 7 to 9; but as the disease progressed and the case became terminal, it shifted to the left, 5 to 7. Four cases died with a coagulation band of 8. The sedimentation rate, however, correlated with the clinical course of this group.

DISCUSSION

The Weltmann serum coagulation reaction was studied on 232 cases in all stages of pulmonary tuberculosis over a period of three to six months. The object of this investigation was to determine the value of routine Weltmann reactions in tuberculous patients, with special reference to prognosis, and a comparison with sedimentation rate and sputum findings.

An analysis of the observations made on this group of cases did not entirely substantiate the results of the investigators quoted in this paper. In the group of 21 minimal asymptomatic cases, neither the Weltmann reaction nor the sedimentation rate were of any prognostic value. In the moderately advanced and advanced groups of cases, the lesions were predominantly fibro-caseous. The Weltmann reaction showed a shift to the right, indicating fibrosis. This shift to the right, an index of healing, was rather misleading, when compared to the clinical course and sputum examinations which were constantly positive for tubercle bacilli. The sedimentation curves, when compared with the positive sputum, were of greater prognostic value than the Weltmann serum reactions.

CONCLUSIONS

1) In the incipient, asymptomatic group, the Weltmann reaction and sedimentation rate are not a true index of the patients' clinical status.

2) In the moderately and far-advanced cases, the Weltmann coagulation reaction showed a fairly constant "shift to the right," but the sedimentation rate and sputum studies gave a better index of the clinical status of the patients.

3) There was a fairly definite correlation between the sputum examination and the sedimentation rate curves, but none between the Weltmann reaction and the sedimentation rate.

4) Neither the Weltmann serum reaction nor the sedimentation rate is completely reliable in determining the prognosis of pulmonary tuberculosis.

CONCLUSIONES

1) En el grupo de enfermos en los que la tuberculosis se encuentra en el período incipiente, y sin síntomas, la reacción de Weltmann y el coeficiente de sedimentación no constituyen índices auténticos del estado clínico de los enfermos.

2) En casos moderadamente y muy avanzados, la reacción de coagulación de Weltmann reveló un "cambio hacia la derecha" con bastante constancia, pero el coeficiente de sedimentación y los exámenes del esputo demostraron ser un mejor índice del estado clínico de los enfermos.

3) Se demostró una relación recíproca bastante exacta entre los resultados del examen del esputo y el coeficiente de sedimentación, pero no se pudo demostrar correlación alguna entre la reacción de Weltmann y el coeficiente de sedimentación.

4) Para hacer el pronóstico de la tuberculosis pulmonar no se les puede prestar completa fe ni a la reacción hemosérica de Weltmann ni al coeficiente de sedimentación.

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Chemotherapy of Tuberculosis*

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INTRODUCTION

It is the intention to focus anew in this paper the attention of physicians, and particularly phthisiologists, upon a type of therapy which, at present, does not play the role in the treatment of tuberculosis which it deserves. Chemotherapy of tuberculosis has been in eclipse for reasons which are understandable, but do not suffice to justify refusal of its possible benefits to a patient afflicted with tuberculosis. Chemotherapy of tuberculosis is essentially gold therapy. Gold therapy is usually identified in this country with the use of Sanocrysin. In reality, this type of treatment is much older. Original experiments with gold salts go back to Robert Koch.

As early as twentyfive years ago, preparations of Aurocanthan, Krysolgan and Triphal gave evidence of a specific effect therapeutically upon tuberculous tissue. However, their high toxicity prevented their use on a large scale.

World-wide interest in gold therapy was reawakened by Moellgard's publication of his and Secher's results with Sanocrysin. Enthusiastic reports were followed by disappointment of other workers who were justified in pointing out the severe damage done in many cases. It is now generally agreed that this was largely due to the administration of too large doses. However, the result was unfortunate in that the majority of the physicians in this country abandoned the use of gold preparations entirely. European workers and investigators in other parts of the world, as well, insisted that they had seen favorable results in cases where other types of treatment proved unsuccessful or could not be administered. In 1933 Henrichsen and Sweany[1] published a comprehensive report about their experiences with Sanocrysin at the Chicago Municipal Tuberculosis Sanitarium. They arrived at qualified but, on the whole, favorable conclusions and confirmed the now general consensus of opinion that reduction of the dosage markedly reduced the complications attributed to Sanocrysin.

Adolf Feldt, one of the pioneers in the field of chemotherapy of tuberculosis, endeavored for many years to develop an organic gold compound having sufficient therapeutic effect without causing

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*Read before the Boston Trudeau Society, Rutland State Sanatorium, Rutland, Massachusetts, May, 1941. From the New Hampshire State Sanatorium, Glencliff, N. H.
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harmful complications. In 1924 Solganal A, an organic sulfur-gold compound, was submitted for trial and Freund and others[4] reported very remarkable improvement in many cases, although gold exanthemata, some of severe nature, occurred. In 1937 an extensive debate about gold therapy of tuberculosis took place at the German Tuberculosis Congress at Wiesbaden, and it was stated that a literature of about three thousand papers had appeared so far. This confirms a remark in an editorial of *Lancet* in 1932, which reads: "We are by no means at the end of the chapter." Many promising reports were published on the effect of Solganal-B Oleosum, which Feldt developed from his older Solganal A. This preparation has been in use on a large scale in Europe and has been proved only slightly toxic, without loss of effectiveness. After using it previously for many years at other places, the author of this paper has given it a trial of three years at the New Hampshire State Sanatorium,* and is convinced of its usefulness in properly selected cases. Reports about the earlier results appeared in the *American Review of Tuberculosis*.[6] This paper will deal with the general principles of the method of administration and conclusions derived from further clinical studies.

THEORETICAL CONSIDERATIONS

Solganal-B Oleosum is an aurothioglucose suspended in oil and belongs to the organic gold compounds which are, in their effect upon the tuberculous tissue, different from inorganic preparations. The empirical formula is $C_6H_{11}O_5SAu$. The "therapeutic index" (Ehrlich), which is defined as the relation between the smallest healing and the largest tolerable dose, amounts to 1:50 for Solganal-B Oleosum and 1:4 for Sanocrysin. Originally it was assumed that gold preparations had a direct bacteriotropic and bactericidal effect upon tubercle bacilli. Early experiments of Robert Koch pointed in that direction and he was able to prove that 1:200,000 dilutions of gold salts sufficed to prevent tubercle bacilli from growing on artificial media. Moellgard believed that his Sanocrysin was bactericidal and bacteriolytic and met the requirements of Ehrlich's "therapia magna sterilisans."

Experiments performed by A. Feldt and other workers led to the conclusion that chemical preparations effective in tuberculosis influence mainly the diseased organism as a whole and have only an indirect bearing upon the disease by stimulating the defense forces of the body. The reticulo-endothelial system, as conceived by Aschoff, acts as a catalyst. The main support for this conception is the experience that very small doses of gold compounds are still effective

*The Solganal-B Oleosum was supplied through the courtesy of the Schering Corporation, Bloomfield, New Jersey.

in experiments on diseased animals, although they do not exercise any damaging influence upon bacteria in test tubes. On the other hand, reduction or elimination of the action of the reticulo-endothelial system diminishes the healing effect of gold compounds upon protozoic and bacterial infections. The change in the leukocyte picture during gold treatment, and particularly the appearance of monocytosis, are regarded as significant of the reaction of this cell system. A few hours after the administration of gold preparations, the so-called activation of the reticulo-endothelial system in the liver, as well as in the spleen, becomes noticeable. This means a more pronounced visibility and increase in the number of the Kupffer star cells and the formation of fine vacuoles, which sometimes can be dyed with basic dyes. The importance of the reticulo-endothelial system is readily demonstrated by the regular presence of large mononuclear cells which constitute an integral part of the anatomy of the tubercle and are nothing else than Aschoff's histiocytes, or Metchnikoff's macrophages with their phagocytic capacity. Evaluating this fact, it becomes understandable that gold therapy yields the best results in exudative cases which show the most active mutual relationship between the intruder and the defense forces of the body.

INDICATIONS

To determine the place of chemotherapy in the treatment of tuberculosis, it stands to reason that in its present form it cannot replace any form of collapse therapy or basic conservative treatment. However, there remains an important field, and in spite of all controversy, the indications for chemotherapy can be well outlined. As already pointed out, exudative cases even of the far-advanced type and with cavities, often respond favorably to gold treatment. Acute infiltrative spreads occurring in old chronic, fibrotic lesions, as well as contra-lateral spreads during pneumothorax treatment or following thoracoplasty, often disappear within two or three months. Frequently gold therapy makes the administration of a pneumothorax on the contralateral side unnecessary, or the patient is spared a second stage of thoracoplasty. I cannot agree with Kayne,[3] who holds, speaking of Sanocrysin, that in the presence of a cavity a pneumothorax should always be induced. It is very much worth while to finish a full course of Solganal-B Oleosum, which should be preferred to Sanocrysin if x-ray, physical examination and blood test indicate a definite improvement within six weeks. The disappearance of cavities solely under gold treatment has frequently been observed and has been reported by the author of this article in the *American Review of Tuberculosis*.[6]

Only recently, Skavlem[7] and co-workers emphasized that indis-

criminate use of pneumothorax treatment in exudative cases accounts for many cases of empyema, and suggested that a temporary phrenic crushing would transform an acute, exudative case into a more benign productive or fibrotic type, which shows far less complications when pneumothorax is administered. This is undoubtedly true and remains valid when gold treatment is used instead of a phrenic crushing. Although it is not easy to prove this statistically in a sufficiently large number of patients, I feel in full accord with the opinion of Skavlem and his co-workers, after an experience of over fifteen years with gold treatment.

One sometimes witnesses an attempt to improve the results of an incomplete pneumothorax by additional gold treatment. A simple mechanical consideration makes it obvious that no result can be obtained. Adhesions which keep cavities open and under tension counteract the tendency towards fibrosis which could be the final and satisfactory result under gold treatment alone. It is better, therefore, to discontinue a dangerous and useless pneumothorax treatment and turn to gold. After some time, the possible extent of improvement can be surmised; and if no full healing, but only partial improvement is noted or can be expected, thoracoplasty would be the procedure of choice. Smith, of England, believes that gold treatment shows its value in collapse therapy in preventing a spread to the contralateral lung. It is difficult to conceive how this can be proven.

It must be stressed that the so-called acute, benign, exudative lesions of Ornstein's and Ulmar's classification should not be the object of gold therapy. They often heal under bed rest. The type of tuberculosis dealt with above cannot be considered as benign in the presence of cavities.

The use of gold treatment is not so much determined by the extent of the diseased area as by the amount of resistance the patient has. Unfortunately, we do not have any reliable clinical yardstick for determining this, with the exception of a negative tuberculin test, indicating the complete breakdown of resistance. A high sedimentation rate or an unfavorable differential count often change surprisingly fast. Their value rests in revealing the actual activity rather than in permitting a prognosis. Only clinical experience, and to some extent the method of trial and error, will teach the proper selection of cases. For this reason, gold treatment should be administered mainly in clinical institutions, and occasionally in ambulatory cases, if proper safeguards can be taken by the attending physician, who should have experience with this type of treatment.

Productive cases do not show as striking results as the exudative ones. The histo-pathological picture of this type of tuberculosis implies a slower tissue reaction to the toxic agent. However, they

also improve through the developument of fibrotic tissue. Whereas recent cavities with a wall of soft exudative tissue answer favorably to gold, no benefit can be expected if the cavity wall consists of fibrotic tissue. This fact has often not been heeded and has accounted for many failures. Not infrequently it is possible to observe the flare-up of an exudative reaction of a cavity wall, through a series of x-rays. Cavities which appeared to be stabilized show a sudden increase of the width of the cavity wall, sometime followed by dissemination of the disease elsewhere. During this period, which also expresses the renewal of the fight between the bacillus and the organism, gold treatment offers an excellent chance. Continuing this line of thought, it becomes clear that old fibrotic cases should not be treated with any hope for a decisive change. Unless conservative treatment suffices, they belong to the surgeon's realm.

SURVEY OF TREATED CASES

In the course of three and one-half years the author has treated 32 cases with Solganal-B Oleosum. In two instances, gold was given, although the hopelessness of the prognosis was fully evident. Both patients died within a few weeks. Seven cases did not show any noticeable improvement, although they received a full course of Solganal-B Oleosum over a period of several months.

Ten patients showed definite improvement. X-ray shadows disappeared. Sedimentation rates decreased. Recent spreads were absorbed, and in some of these cases it was possible to institute collapse therapy, particularly pneumothorax treatment after they had passed the acute stage in which hypersensitiveness to tuberculotoxins made institution of a pneumothorax dangerous because of possible complications. Sputa conversions could not be achieved in the majority of this group. However, there was definite clinical improvement and the impression was gained that this type of treatment brought the patients beyond the danger zone.

The most important group consisted of 12 patients whose lesions were mostly of the exudative type. In 8 of them, the cavities present at the beginning of the treatment, many larger than half-dollar pieces, disappeared within the course of several months. All patients had, at the end of the treatment, normal sedimentation rates, and showed either a marked diminution or complete disappearance of rales.

It has to be admitted that guinea pig inoculations were not done in these cases. However, roentgenological evidence of improvement and disappearance of cavities was so obvious that the author feels justified in claiming results better than obtainable by other methods of treatment.

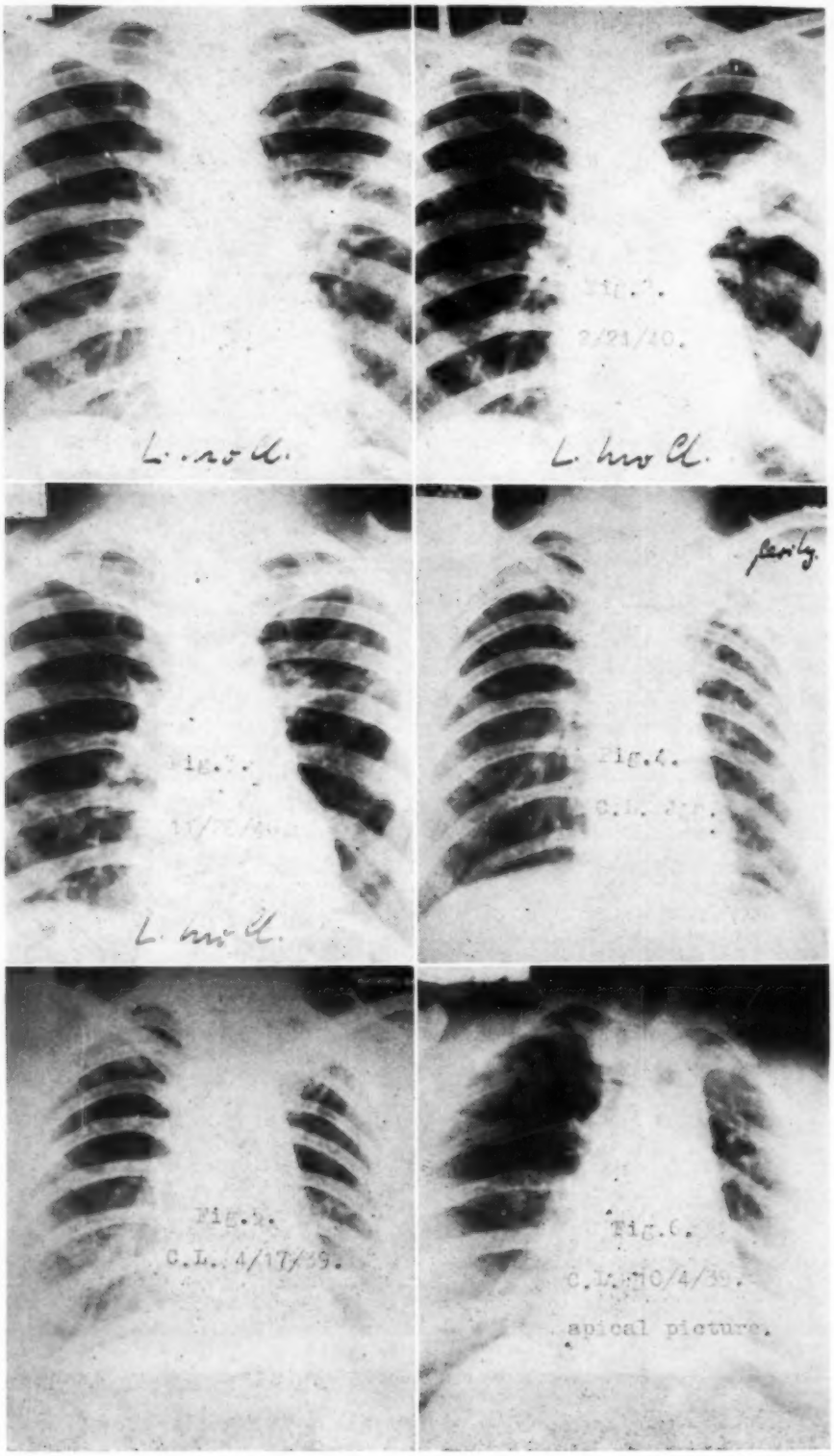
Fig.2.
2/21/40.
Fig.3.
Fig.4.
Fig.5.
C.L. 4/17/39.
Fig.6.
apical picture.

CASE REPORTS

The following x-rays and short histories of several cases may prove the value of gold treatment.

Case 1—L. McCl., female, white, age 25, was admitted January 2, 1940, with large cavity in left middle lung field (Fig. 1). Tubercle bacilli present in sputum. Sedimentation rate (Westergren), 45/71. Pneumothorax attempted on the left side was unsuccessful. Thoracoplasty was contraindicated because of high activity.

Under bed rest, the lesion spread (Fig. 2). Patient developed fever and raised large amounts of sputum. Many rales were heard over the diseased area anteriorly and posteriorly. On Feb. 24, 1940, she was placed on Solganal-B Oleosum. Total amount of Solganal-B Oleosum given in seven and one-half months was 8.74 gm. Rapid improvement followed. In February, 1941, there was no cough and no sputum; sedimentation rate, 10/30. X-rays showed disappearance of the cavity. In October, 1941, only a small fibrotic area was left in the left middle lung field (Fig. 3). Sedimentation rate was normal. Gastric lavage showed negative results for tubercle bacilli.

Case 2—C. L., female, white, age 22. On admission in January, 1939, both upper lung fields were involved with a cavity (not well visible on picture) 1 inch in diameter at the level of the clavicle (Fig. 4). Sputum was positive. Sedimentation rate, 35/61.

An attempt to establish pneumothorax on the left side was unsuccessful. She was placed on Solganal-B Oleosum. Sputum was converted after five months, and has remained negative since. Sedimentation rate became normal in July, 1939, and has remained normal since. Moist rales which were present over left upper half anteriorly and posteriorly on admission have disappeared. A postero-anterior x-ray (Fig. 5) and a special apical picture (Fig. 6) showed the disappearance of the cavity. There has been improvement also in the right first interspace.

Total amount of Solganal-B Oleosum administered between Feb. 8, 1939, and Sept. 6, 1939, was 9.76 gm.

Case 3—S. L., age 35. Admitted June 13, 1940. On admission patient did not raise any sputum. There were very scanty physical findings restricted to some dullness over the right upper 3rd. No rales; normal breath sounds. X-rays showed a cavity one inch in diameter just beneath the right clavicle and a few indistinct foci in its neighborhood (Fig. 7). Sedimentation rate was 7/19. Sputum was not obtainable. A pneumothorax was instituted on the right side but was discontinued because of incomplete collapse. In October, 1940, he began to raise sputum and tubercle bacilli were found. At this time thickening of the cavity wall was noted and shortly afterward a hemorrhage and a spread into the left lower lung field occurred.

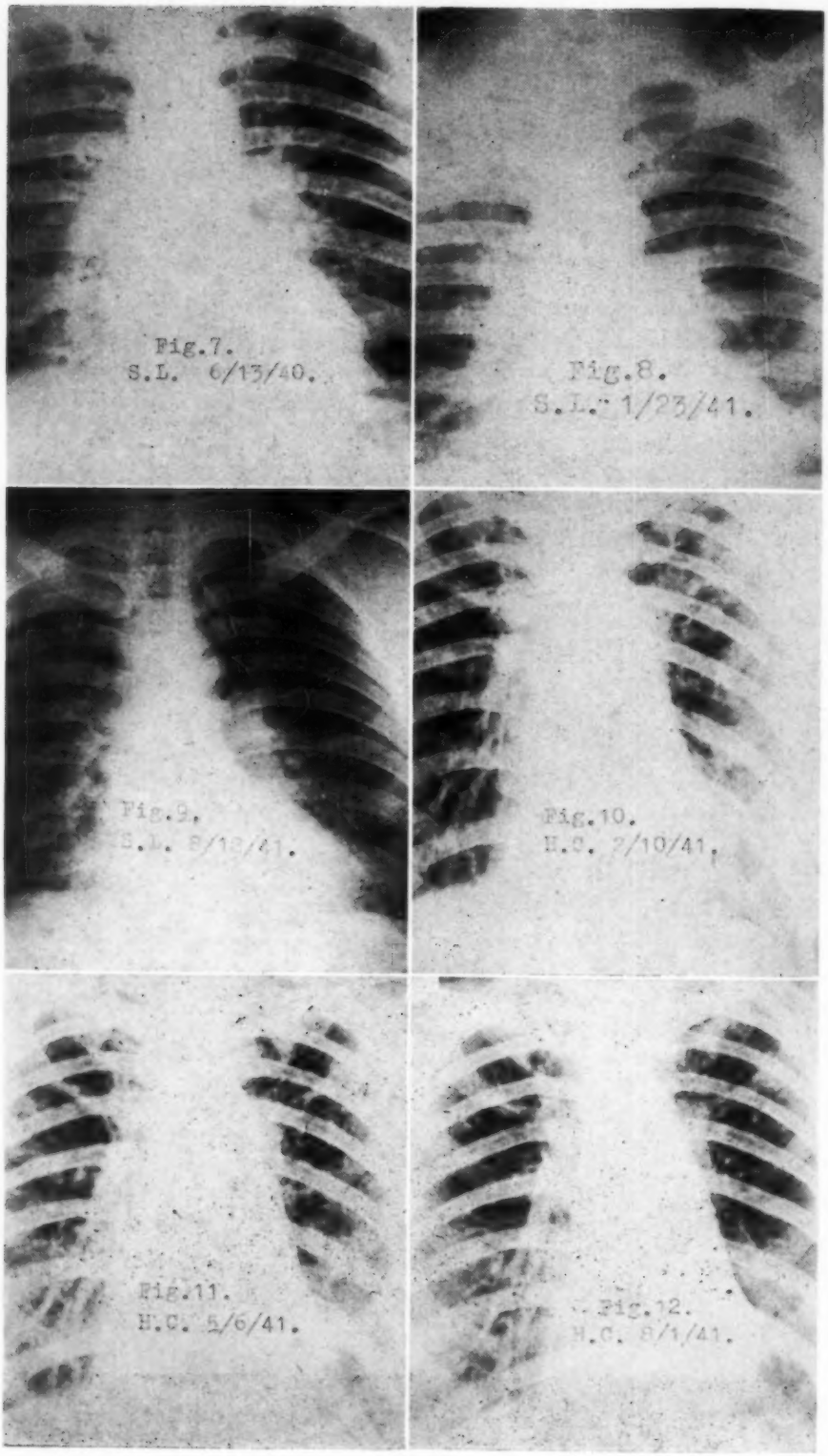
Fig.7.
S.L. 6/13/40.
Fig.8.
S.L. 1/23/41.
Fig.9.
S.L. 8/12/41.
Fig.10.
H.C. 2/10/41.
Fig.11.
H.C. 5/6/41.
Fig.12.
H.C. 8/1/41.

In January, 1941, (Fig. 8) the patient was placed on treatment with Solganal-B Oleosum, and in the course of 7 months the cavity as well as the spread disappeared completely. Sedimentation rate went back to normal, 12/4. Total amount of Solganal-B Oleosum given in 7 months was 7.395 gm. At present, 4 months after Solganal-B Oleosum treatment, patient does not raise any sputum, and there are no rales heard anywhere. The original intention to perform a right sided thoracoplasty has been abandoned (Fig. 9).

In this case it ought to be noted that the patient was an extremely nervous man and developed during the treatment a herpes zoster over the right chest. The herpes zoster called for temporary discontinuation of Solganal-B Oleosum treatment. After resumption of treatment no further complications occurred.

Case 4—H. C., female, age 35. Admitted February 9, 1941. She was a former patient at the New Hampshire State Sanatorium from November, 1937 to October, 1938. At that time, the patient had a productive lesion of the upper portion of both lungs without cavitation and sputum. Sedimentation rate was 20 mm. Patient was discharged after treatment with bed rest over 11 months, without showing any improvement. Following discharge, patient was at home, and although at rest, grew slowly worse and reentered the sanatorium on Feb. 9, 1941.

On readmission (Fig. 10) spreading of the lesion into both middle lung fields with formation of a cavity of the size of a half dollar was noted. Sputum contained tubercle bacilli and sedimentation rate was 21/46. Since continuous bed rest at home did not arrest the disease, Solganal-B Oleosum treatment was started shortly after admission (Fig. 11). In June, sedimentation rate became normal for the first time, and sputum did not show any tubercle bacilli. Appearance of a few granular casts in the urine called for a short interruption of the treatment, but resumption was possible and the total amount of Solganal-B Oleosum given was 9.07 gm. Treatment was discontinued in October 1941 (Fig. 12). Serial x-rays showed definite regression of lesion and disappearance of cavity. Urine is now free from pathological elements, and numerous sputa were negative for tubercle bacilli. Sedimentation rate has been normal since June.

MANAGEMENT OF TREATMENT

It goes without saying that the wide divergence of individual cases requires an individual approach in carrying out the treatment. Generally, it can be said that a total dosage of 9 or 10 grams of Solganal-B Oleosum should not be exceeded. Small doses up to 200 mgs. can be given twice a week. During menstruation treatment has to be interrupted. Routine urine examinations for albumen, white blood counts, and sedimentation tests are necessary. Focal reactions are

rarely observed; however, temperatures should be taken every four hours to rule out undesirable surprises. Not infrequently casts are found, although albumen is absent. This fact has impressed the author lately more than in the past. Nevertheless, the casts disappear within 2 or 3 weeks after interruption of the treatment and resumption with smaller doses is permitted. Occasional rashes occur but are transitory. The rashes are treated with cevitamic acid and injections of calcium gluconate. Mirick reported one case of agranulocytosis after administration of Solganal-B Oleosum. I feel that careful clinical observation renders such accidents avoidable.

If a patient fails to improve after three or four months, further treatment is generally useless. Only cases showing definite clinical and roentgenological improvement beyond the average results of conservative treatment, should serve as proof of the efficiency of gold treatment. It sometimes happens that during the course of the treatment, in spite of initial improvement, a new spread into hitherto healthy areas of the lungs occurs. This confronts us with the decision whether or not to continue the treatment. Without being able to give logical reasons for my decision, I continued the treatment in two cases and succeeded in achieving further improvement of the condition. At present, we are not yet in a position to determine and to analyze the immuno-biological factors having a bearing upon the course of the disease, and have to feel our way, depending upon clinical experience and available laboratory tests. It also must be emphasized that there is no well defined relationship between the amount of gold used and the therapeutic results. Aften a surprisingly low amount suffices to achieve the desired goal.

CONTRAINDICATIONS

As stated above, no success can be expected if the resistance has broken down completely. In addition, certain contraindications against the use of gold must be heeded. Extensive intestinal and kidney involvement rule out its use. Sometimes a subclinical intestinal tuberculosis becomes apparent and calls for discontinuation of the treatment. Laryngeal tuberculosis, however, often answers favorably to gold, and it was originally considered the most suitable type of tuberculosis for this treatment until gradually increasing clinical experience broadened the scope of the indications. Gold therapy is not advisable when diabetes mellitus coexists. I could not gather any information from other sources concerning this question, but in several of my own cases the patients reacted to gold injections with uncontrollable focal reactions and rapid progress of the disease. Cases of hematogenous and extrapulmonary tuberculosis should generally not be treated with gold because of their tendency to develop unexpected spreads (meningitis).

CONCLUSIONS

1) At present, gold therapy is a valuable adjunct in the armamentarium of the treatment of tuberculosis.

2) Predominantly exudative cases give the best results, as proven by the disappearance of large infiltrations, cavities up to a diameter of 2 inches, and tubercle bacilli in the sputum. Recent spreads often disappear in a short time. Conversion of exudative lesions into productive, fibrotic tuberculosis improves the result of collapse therapy and makes complications (empyema) less probable.

3) Renal and intestinal involvement, as well as cases of hematogenous origin, contraindicate the use of gold.

4) There is no fixed relationship between the amount of gold given and the therapeutic results achieved. The amount of 9 or 10 gm. should not be exceeded in one course.

5) At present, Solganal-B Oleosum is considered the least toxic and yet effective gold preparation.

6) Gold therapy is nosotropic and stimulates the immuno-biological activity of the reticulo-endothelial system. The development of bacteriotropic preparations is desired.

7) Frequent urine and blood examinations should be done to exclude possible toxic complications. With such precautions, possibilities of complications are no greater than in other widely accepted forms of chemotherapy.

CONCLUSIONES

1) Al presente la auroterapia es un auxiliar valioso en el tratamiento de la tuberculosis.

2) Casos predominantemente exudativos dan los mejores resultados, como se comprueba por la desaparición de infiltraciones extensas, cavernas hasta de un diámetro de 2 pulgadas, y bacilos tuberculosis en el esputo. Propagaciones recientes desaparecen a menudo en poco tiempo. La conversión de lesiones exudativas en lesiones de tuberculosis productiva y fibrosa mejora el resultado de la colapsoterapia y disminuye las probabilidades de la ocurrencia de complicaciones (empiema).

3) Complicaciones renales e intestinales, también como casos de origen hematógeno, contraindican el uso de oro.

4) No existe conexión fija entre la cantidad de oro administrada y los resultados terapéuticos alcanzados. No se debe exceder la cantidad de 9 o 10 gramos en una serie terapéutica.

5) Al presente se considera que el Solganal-B Oleosum es la preparación de oro menos tóxica y al mismo tiempo eficaz.

6) La auroterapia es nosotrópica y estimula las actividades inmunobiológicas del sistema reticuloendotelial. El desarrollo de preparaciones bacteriotrópicas es deseable.

7) Se deben llevar a cabo exámenes frecuentes de la orina y de la sangre para excluir posibles complicaciones tóxicas. Con estas precauciones, las probabilidades de complicaciones no son más que en otras formas de quimioterapia generalmente aceptadas.

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World Planning for Tuberculosis Control

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We are committed by the great leaders of our United Nations to the establishment of the four freedoms and all that the four freedoms entail, which includes of course, the stamping out and control of pestilence, not the least of which is tuberculosis.

We are also committed by the humanitarian instincts of the American people who have always lent a sympathetic and helping hand to any country in time of great catastrophe. What greater suffering could befall any people than is now endured by the imprisoned populations of Europe and China?

Tuberculosis is a persistent camp follower of war so there is little point in enumerating the many reasons why we should expect tuberculosis to be the greatest disease menace to the people of all enemy-occupied countries.

Following World War I, the French records show that in German occupied France deaths from tuberculosis were 3.3 per 1,000 before the war. From 1916-17 they rose to 5.75 per 1,000. However, tuberculosis increased in all other countries during and after World War I, including the United States. The death rate was so alarming, especially in France and Germany, that the attention of our people was directed toward it, resulting in surveys and aid in various ways.

A limited survey in certain districts of Germany occupied by American troops was conducted by Colonel Bruns (MC), U. S. Army. Later the Rockefeller Foundation and the American Red Cross completed similar work in some sections of France.

Today the situation is quite different in all of the occupied countries than it was during World War I. What with food they produce taken from them, the enslavement of labor, concentration camps, broken homes, indescribable living conditions, is it not reasonable to say that the limits of human suffering must be near at hand. It is estimated that there are now 10,000,000 tuberculosis cases in Europe alone. A recent report states that tuberculosis among children has increased 80 per cent in Belgium, and is spreading rapidly, with 16,000 new cases registered in four months. If these figures are reasonably reliable, they are proof that the same conditions must prevail in all Nazi enslaved countries, and may be much more grave in such countries as Poland and Greece.

It is difficult indeed for us to visualize the real conditions as they exist today. If the increased death rate from tuberculosis in France and Germany caught the attention of our military authorities and our humanitarian agencies following the last war, there can be little doubt but that our people will be doubly impressed and shocked when the true facts are revealed. Therefore, it is believed a well thought-out and coordinated plan of procedure should be prepared as far in advance as possible.

It is to be presumed that our present policy contemplates keeping our armed forces in many of these countries for an indefinite period. At least

until orderly government has been established. No doubt this is why the school for military government has been convened at Charlottesville, Virginia.

Many believe that as our armies move into these countries, they should be accompanied by a trained medical personnel prepared to meet all local medical problems, especially tuberculosis problems. It is felt that much more could be accomplished by specially trained control teams attached to the medical department of each army of occupation, and not wait for various foundations to undertake the necessary tasks at a later date. These military control teams could at least blaze the trail and should information assembled by them reveal great problems of hospitalization and rehabilitation beyond the province and scope of the medical department of the army, such information could then be made available to the agencies and foundations prepared to take over and complete the work.

It was the writer's privilege to be associated with Colonel Bruns for a short time while he was making preparations to initiate a limited tuberculosis survey in Germany during the early occupation period. It was found at that time that local physicians, and educational leaders cooperated beautifully in really conducting the survey; but of course under the direction of Colonel Bruns. From the writer's observation at that time, his conclusion is that any survey and control program eventually to be undertaken in Europe or elsewhere should be inaugurated by military medical officers.

Those of us most interested in tuberculosis realize that the tuberculosis patient load in our military hospitals has been, and is very light as compared to the case load of nervous diseases and other conditions. For this reason, it is feared that the gravity of the tuberculosis problem in these occupied countries may be underestimated. Then, too, we must consider the fact that thousands of our soldiers are no doubt non-reactors to tuberculin, and are therefore most susceptible when exposed. We believe that proper machinery should be set up now in order that all information possible be assembled and classified for the information of those whose task it will be to undertake the responsibility not only of protecting our own troops as they occupy these countries, but to control the disease among the civilians as well.

A great deal of the information required is already in the hands of many of our medical and intelligence agencies. Other valuable information may be obtained from the governments in exile in England, the French authorities in North Africa, and from all neutral sources.

We have prepared a suggested plan, somewhat rough, but which can be developed and improved as time and changing conditions may warrant. If a definite plan is worked out now, the regrettable common saying, "Too little and too late" will not apply in this particular instance.

The proposed plan for a United States Military Tuberculosis Commission will be found on the next page.

A Proposed Plan for a United States Military Tuberculosis Commission*

ORGANIZATION

1) The commission to consist of three or more medical officers who are highly qualified chest specialists known to have vision, imagination, and executive ability.
2) The senior member of the commission to act as director.

PURPOSES

1) To assemble and classify all obtainable information pertinent to the protection of our own troops, and the study and control of tuberculosis in each country most likely to be occupied by units of the U. S. Army.
2) To select for the approval and appointment by the Surgeon General, medical personnel to constitute "Tuberculosis Control Teams."
3) To administer the training of control teams utilizing all assembled information in order that the control teams may accomplish their mission in each specific country when occupied.

TYPE OF INFORMATION TO BE ASSEMBLED

1) The comprehensive study of the geography of each country.
2) Population of each country, city and subdivision thereof.
3) A study of the public health laws of each country which were in force at the time of enemy occupation.
4) A study of all medical organizations and anti-tuberculosis societies in each country.
5) To attempt to secure the rosters of each of the above organizations.
6) To secure the number and type of hospitals and sanatoria in each country, city and subdivision.
7) The amount of x-ray equipment available in each city and subdivision of each country.
8) The availability of x-ray films, developing solutions, and information concerning the manufacture thereof.
9) The names of the leading chest specialists in each city and subdivision of each country.
10) Information concerning the death rate of cities and subdivisions of each country at the time of enemy occupation.
11) The approximate death rate in each country at present.
12) Information concerning educational institutions, schools, colleges, public and private.
13) Information concerning educational leaders in each city and subdivision of each country.
14) To assemble and classify all possible information concerning the above-mentioned points for each enemy country.

PERSONNEL OF CONTROL TEAMS

1) The amount of personnel required for each team would be determined by the size and population of the country concerned.

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*To be appointed by the Surgeon General, U. S. Army.

2) The officer personnel for each team should be not less than three medical officers who are qualified chest specialists, and two or more officers in the nurses' corps who have had special training in tuberculosis.

3) Enlisted personnel should be technicians and at least 50 per cent should have a working knowledge of the language of the country to which the team would be assigned.

TRAINING OF CONTROL TEAMS

The personnel of each team could be assembled at the most convenient point, and members of the commission instruct the team along the lines laid down by the commission on the basis of assembled information.

MISSION OF CONTROL TEAMS

1) To protect our own troops by utilizing all information as to the prevalence of tuberculosis among the civil population in certain areas.

2) To keep in close contact with the medical wards in our hospitals in each army of occupation.

3) To utilize the local physicians, anti-tuberculosis societies and school authorities of each country in making tuberculosis surveys of the civilian population.

4) To encourage the local authorities to make such surveys in their own way, so long as their way is efficient and properly carried out.

5) To furnish school and public health authorities with such educational printed matter concerning the control of tuberculosis as seems best to fit the situation in each country, the printed matter, of course, to be in the language of the country.

6) To exercise patience and understanding, and promote goodwill by encouraging and guiding the local authorities in the anti-tuberculosis program of their country. At the same time, insisting that surveys and control programs be completed as rapidly as possible.

7) To assist in every way in the reorganization of the anti-tuberculosis societies.

8) To encourage and insist upon the isolation and proper treatment of all open cases.

9) To assemble complete information concerning conditions encountered insofar as tuberculosis, its control and treatment is concerned.

10) To keep complete and accurate records, and to compile statistics.

11) To make such reports as may be required by the commission.

EQUIPMENT FOR CONTROL TEAMS

1) X-Ray Equipment: The number and type of machines required per team could be determined from the assembled information as to the number of x-ray machines and supplies available in each country, as well as the number of machines anticipated to be with our own medical installations and the population of the specific country.

2) Each control team should be equipped with sufficient office material as is necessary to keep records, issue mimeographed instructions, etc.

ADMINISTRATION OF CONTROL TEAMS

1) For administrative purposes, tuberculosis control teams would be attached to some unit of the medical service of our armed forces occupying a particular country.

EDITORIAL

MEDICAL ADVISORY BOARDS

At some of the induction examining stations medical advisory boards for chest conditions have been set up. Their duties are to assist examining teams in making decisions regarding diseases of the chest. These boards can render a great service; and the procedure is advised and encouraged by our military authorities.

Due to the fact that decisions must be made promptly, examining teams are necessarily hurried, and in many instances, if more time and study were possible, the results would be greatly improved.

At best, the 4x5 film now in use should be considered only as a screen test. This is shown in the report by Erlich, Shiller and Edwards, in which they conclude as follows: "Following a complete study of rejected cases by the New York City Health Department, it was found that the percentage reclassified as acceptable for army service after previous rejection, on the basis of 14x17 (paper) film was half that of those disqualified by the 4x5 film. Most remarkable indeed is the report by the medical division of selective service headquarters of Tennessee which states that out of 8,139 films of selectees rejected for tuberculosis, a special board found 5,286, or 64.9 per cent, negative.

The results of the above studies should encourage all induction examining station commanders to insist upon the appointment of medical advisory boards. These studies should also encourage Selective Service authorities to create qualified boards to review all films of those rejected on account of tuberculosis. It is safe to say that many thousands would be reclaimed by this procedure. If this were accomplished and the special boards found some 4x5 films in an unreadable condition, the draft boards concerned should be notified to have the selectees re-x-rayed by the induction station, and the films sent to the special board for final decision.

While the findings of a special board in Tennessee may be an outstanding example of extreme error, it is reasonable to conclude that errors in all stations are much greater than they should be.

The errors thus far discussed concern only the negative cases. What of the errors in positive cases? These can only be speculative. We do know, however, that there have been 1,670 veterans of World War II admitted to veterans' hospitals between Dec. 7, 1941, and Jan. 31, 1943. There are many cases still under the army's care. Many have been discharged because of tuberculosis, and classified as "Existed prior to enlistment." It is now estimated by some that we may expect 1,000 to 1,500 cases per 1,000,000 persons who will have served in our armed forces. Human errors cannot be eliminated, but properly constituted advisory boards can reduce these errors to a minimum.

C. M. H.

Report of the Council on Military Affairs and Public Health*

American College of Chest Physicians**

Mr. President, distinguished guests, members of the College, ladies and gentlemen: Keeping in mind some of the main objectives of this College; namely, "To protect the specialty of chest diseases, to elevate the standards of the physicians who specialize in this branch of medicine, to co-operate with all existing organizations which are interested in the public health, and tuberculosis particularly"—your Council on Military Affairs was charged with representing the College by assisting in every way possible the essential work of preparedness for National Defense insofar as tuberculosis is concerned.

A year ago at our annual meeting in Cleveland, your Council presented its report which was unanimously accepted by the College. That report included all suggestions made to the medical departments of the armed forces, the United States Public Health and Veterans Administration. Among these suggestions were the following: That all officers and men entering the armed forces be examined by x-ray. . . . That all officers and men be examined by x-ray upon discharge. . . . That x-ray films of all officers and men who are accepted for service be sent to the U. S. Veterans Administration. . . . That all films made upon discharge be sent to the U. S. Veterans Administration . . . That films made of those who had been rejected be made available to the Public Health Department of the state in which the selectee resides. . . . That a short and concise history be kept of each officer and man. . . . That a physical examination, including auscultation be made. . . . That sound-proof or semi-sound-proof booths be provided for such examinations. . . That only medical officers known to be proficient in reading chest films be assigned to that duty. . . . That a medical officer known to be a fully qualified chest specialist be in charge of all officers assigned as examiners of chests and evaluators of chest x-ray films.

Suggestions were made as to the type of film, type of x-ray unit, and the x-ray procedure, to the end that the chest examiner and the

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**Council on Military Affairs, American College of Chest Physicians; Col. Chas. M. Hendricks (Reserve), *Chairman*; Major J. Dwight Davis, U. S. Army; Captain Robert E. Duncan, U. S. Navy; Herman E. Hilleboe, U. S. Public Health Service; Brig. General S. U. Marietta, U. S. Army; Joseph W. Post; Samuel E. Thompson; Walter E. Vest and Roy A. Wolford, U. S. Veterans Administration.

officer evaluating the x-ray films would collaborate in making all final decisions.

In addition to these suggestions, your Council completed a survey of 600 chest specialists and found that about 300 were available and eligible for reserve commissions either in the army or navy. This material was furnished the surgeon generals of the army and navy. Later, the executive offices of the College assisted the American Medical Association, using the information already obtained by our survey; and in addition, the governors of the College from each state made a survey of all chest specialists in their respective states, with the result that there is in our files now a total number of certified chest specialists in the United States, including the District of Columbia, of 1397. This information is also in the office of the Procurement and Assignment Service for Physicians, Dentists and Veterinarians, at Washington, D. C.

Since the chest roentgenogram was to play a large part in determining the physical qualifications of officers and men entering the military service, it was considered advisable to make a survey of the latest thought on the subject of our leading radiologists and clinical phthisiologists, with the view of determining a composite authoritative opinion as to what really constitutes x-ray findings which would be disqualifying by the x-ray film alone. After this survey was completed, the results were put in the hands of the Surgeon General of the Army and the Surgeon General of the Navy, as well as the National Research Council.

Your Committee found that during this time the Section on Tuberculosis of the National Research Council was also working on a suggested clarification of the whole subject of chest examination and x-rays.

It must be clear to the minds of all of us that the reception and induction centers are really the fountainheads of our new army. Upon the medical officers making the final decisions as to whether officers or men are physically qualified rests the responsibility to a great extent of the future health of the army; and in many respects their decisions will determine future government expenditures in pensions and hospitalization. Especially is this true of tuberculosis.

From a tuberculosis standpoint, our armed forces are in a much better position today than they were in 1917 and 1918; because, first, the death rate from tuberculosis in 1940 is slightly less than one third of what it was in 1918. Second, those making the decisions have the benefit of x-ray study.

We must admit that the element of human error will always exist and that errors of judgment will be made; but these errors can be reduced to the minimum *only* by using highly qualified men in making these decisions.

This mass x-ray survey of the men now entering our armed forces is the greatest survey ever undertaken in this country. It is our duty as physicians and as patriotic citizens to see to it that every advantage is taken of this survey.

On behalf of the Council on Military Affairs of the College, I want to thank those in authority in our four great medical agencies for the kind and courteous considerations given your Council and its suggestions.

These authorities today have honored us by sending their personal representatives to discuss for you the tuberculosis problems which confront us as a nation and to tell us how they are dealing with these problems.

I am pleased to tell you that we will be addressed this afternoon by the following speakers: Brig. General Charles C. Hillman, representing the Surgeon General's Office of the Army; Captain Robert E. Duncan, representing the Surgeon General's Office of the Navy; Dr. Roy A. Wolford, representing the U. S. Veterans Administration; Dr. Herman E. Hilleboe, representing the U. S. Public Health Service; and Dr. Esmond R. Long of the National Research Council. Their messages, I am sure, will be most enlightening.

Chas. M. Hendricks, *Chairman.*

The Tuberculosis Problem in the Army*

BRIG. GEN. CHARLES C. HILLMAN, U. S. ARMY
Washington, D. C.

The present military effort has grown, not exactly as Topsy grew, yet without any long-range preconceived plan. As the war clouds gathered over Europe in 1939 we had an ominous feeling of impending disaster, to which we as a nation reacted with an attack of conversion hysteria, the period of the Neutrality Act. Under intensive psychotherapy in 1940 we emerged partially from our psychoneurotic state and, resolutely facing the situation that confronted us, launched the military training program and initiated Selective Service. Then followed "Lend Lease," scrapping of the Neutrality Act, and finally Pearl Harbor. Each phase of the international situation, through to the current period of all-out effort, has had its effect on the selection of military personnel; and, since our approach to the problems of tuberculosis is concentrated largely on the exclusion of individuals suffering from the disease, each had its effect upon the problems of tuberculosis in the Army.

You will recall that the present military effort began as a training program. First there was the mobilization of approximately 70,000 National Guardsmen on August 15, 1940. This was followed by the induction in rapid succession of other units of the National Guard and by the initiation of Selective Service in October of that year. The problems of physical examination were not new. Since World War I consideration has been given to mobilization procedures, including the examination of prospective military personnel with a view toward excluding the physically unfit. However, views in the matter varied widely from examinations to be conducted by the village doctor at thousands of locations throughout the country to a limited number of well-organized boards of specialists, not to exceed one or two in each State. In my opinion it is fortunate that the number of examining boards was finally limited to ten or twelve for each corps area.

To visualize more clearly the problems which arise in connection with the examination of military personnel, one must understand the Army policy of decentralization. In order not to build up a cumbersome and unwieldy overhead organization in the War Department, certain routine matters are delegated to corps area commanders. Induction examinations are among the procedures so

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*Presented June 7, 1942, before the American College of Chest Physicians, Atlantic City, New Jersey.

delegated. One must understand that in bringing large numbers of individuals into the military service there are many administrative, housing, and transportation problems as well as physical examinations to be considered; also, that while the Surgeon General can advise, the final decision in such matters rests with the War Department, or the corps area, in matters which have been delegated thereto. It has been the War Department's policy to bring all induction procedures as near as possible to the registrant's home and to divert him for the minimum time from his peacetime pursuits. There entered into the picture, therefore, not only the factors of time, place, and coordination with other necessary induction procedures, but also the factor of decentralization to nine separate corps areas.

In connection with chest examinations the desirability of routine x-rays had long been recognized by the Surgeon General's Office as well as by the civilian medical profession. But considerations other than medical entered the picture and the character of induction examinations had to be adapted to the limitations of time, place, and available equipment. Full use was made of all available radiological facilities, private, State, and Federal, so that physical examinations should include chest x-rays as far as it was possible to do so. Standard 14 x 17 films, 14 x 17 paper films, and 4 x 5 miniatures were employed according to their availability. No expense was spared to accomplish the desired end. At the same time prompt action was initiated to secure adequate government-owned radiographic equipment. As facilities increased, the proportion of men who had chest x-rays as a part of their physical examinations grew until finally at the beginning of this year chest roentgenograms became the routine procedure on all inductees and voluntary enlistments as well as on all officers, warrant officers, and nurses entering the service.

One of the problems which would not appear troublesome on superficial thought was the delineation of physical standards. The individual with physical findings of intrathoracic abnormality and x-ray evidence of tuberculosis is readily recognized as unfit for military service, but the criteria for rejection on radiographic findings alone are extremely difficult to determine; and even when they have been reduced to writing they are difficult to apply uniformly in practice. If you do not agree with me on this point, I can only suggest that you place before any group of recognized phthisiologists the chest films of a dozen borderline cases and note the argument that will promptly ensue. Knowing that this situation exists among physicians skilled in chest diagnosis, one will not wonder at occasional errors on the part of less competent examiners.

Some doubt has been expressed as to the care taken by examiners in eliciting and evaluating the medical histories of inductees under examination. In this connection I wish to remind you that the

individual is rare who does not have a definitely positive or negative attitude toward entering the Army. Long experience has demonstrated that the history obtained by a medical examiner is likely to be highly colored by the individual's desire to be accepted or rejected for military service, and its value is correspondingly lessened.

With the need for utilizing all available manpower in the present state of active warfare, there has been a decided effort toward individualistic study and interpretation. This has applied especially to the examination of applicants for appointment as officers and as members of the Army Nurse Corps. An administrative mechanism has now been established whereby the chest films of questionable cases among applicants for commission will be reviewed by an experienced phthisiologist in the Surgeon General's Office. In the interpretation of films every effort is made to consider all available supplementary information such as the age of the individual, his family history, general condition, and other suggestive evidence of tuberculosis.

The regulations delineating physical standards have been modified as experience and further considerations have dictated. A troublesome question has concerned the evaluation of calcified lymph nodes and parenchymal lesions in their relationship to fitness for military service. It is possible that we have been overly cautious in regard to these findings. Consideration is now being given to this phase of the matter and it is likely that the physical standards will be relaxed to some extent in their application to calcified intrathoracic lesions.

Physical standards have varied according to the objective of the moment. In the early part of our military expansion, training was the end toward which all efforts were directed. From the viewpoints of economy and efficiency, it was contemplated that only those men would be selected who could be expected to withstand a year of intensive uninterrupted military training and then could be transferred to the Reserve with a reasonable expectation that they would remain physically qualified for military service for the ensuing ten-year period. These considerations led to a policy of selection which was rather generally looked upon as unreasonably rigid. One wonders whether among such critics there were any who really gave serious thought to the inadvisability of investing a costly year of training on any except those who bore promise of remaining physically fit not only through their period of instruction but also for years thereafter.

One of our great difficulties has been the mobilization of skilled professional talent to interpret chest films at induction and other examining stations. While it is recognized that there have been instances in which incompetent examiners have been assigned to

interpret films, it is believed that in general the interpretations have been quite well done. With the present tendency toward the operation of fewer induction stations, greater skill in making physical examinations and interpreting films may be anticipated.

In order to make the fullest use of chest films, central filing facilities have been established. The films of men inducted under Selective Service are being forwarded to the Veterans Administration in Washington, where they will be available to supplement other medical records in the adjudication of claims for compensation. Films of officers and nurses are being filed in a special file at the Army Medical Center from which they may be withdrawn and forwarded to any station in the Army where they may be required. It is believed that these files will constitute a valuable source of research material when considered with subsequent medical records of individuals in the Army. Films of selectees rejected because of roentgenological evidence of intrathoracic disease are turned over to State Selective Service Headquarters for subsequent use in the follow-up of such individuals as civilians.

The Army admission rates per thousand for tuberculosis in 1917 and 1918 were 11.7 and 9.2, respectively. Compared to this, our rate of 2.7 in 1941 is very gratifying. Since case analyses indicate that our admissions for the last fifteen months have come largely from those upon whom it was impossible to get chest roentgenograms upon induction, one may anticipate that, with our ability at this time to secure x-rays on all individuals entering the service, future admission rates will be even more satisfactory.

For those unfortunates who may develop tuberculosis while in uniform, ample treatment facilities are provided. Men whose tuberculosis is service-connected are transferred to the Veterans Administration for further care. Those who are found to have tuberculosis not incident to the service are transferred to Fitzsimons General Hospital. To provide facilities in the East to supplement those of Fitzsimons General Hospital in the West a new general hospital is now under construction at Asheville, North Carolina.

In summary we may say that since the initiation of our current military expansion, the Surgeon General has been fully cognizant of the problems of tuberculosis in the military service; that a vigorous policy has been pursued throughout this period to exclude tuberculous individuals from the armed forces; that, while the results have not been theoretically ideal, they have been excellent when viewed in the light of our initial state of national unpreparedness; and that with the uninterrupted progress that has been made in all phases of the problem we may look with confidence to the future handling of tuberculosis in the Army.

Photofluorographic Chest Survey of Naval Personnel*

CAPT. ROBERT E. DUNCAN, F.C.C.P., U. S. NAVY
Washington, D. C.

At the luncheon meeting of this committee last year, I had the pleasure of reading a paper on 35 mm. photofluorography as used in the Navy. This year, at the suggestion of Colonel Hendricks, I am going to devote the ten minutes allotted to me to a statistical report of the results obtained by the use of this method in the mass chest survey of all persons entering the Naval Service.

In the discussion of the report submitted by this committee last year, considerable concern was expressed over the failure of the military services to x-ray 100 per cent of their recruits. At that time the Navy had not reached that most desirable goal, but was making quite rapid strides toward it. I am happy to report that for some months our chest x-ray program has been 100 per cent. All persons entering the Naval Service now receive an x-ray examination of the chest, either a 35 mm. photofluorogram or the standard 14 x 17 in. roentgenogram. A circular letter issued by the Chief of the Bureau of Medicine and Surgery, makes a roentgenographic examination of all Naval and Marine Corps personnel entering or ordered to duty mandatory. The following excerpt is quoted from that directive: "Enlisted personnel, U. S. Navy, U. S. Naval Reserve, Retired Naval Reserve, U. S. Marine Corps, U. S. Marine Corps Reserve and Retired U. S. Marine Corps Reserve shall have a roentgenographic examination upon arrival at the established training stations or bases, except that such enlisted personnel as may not be assigned to a training station or base shall have such examination at the first place of duty accessible to x-ray facilities. In all cases report of examination shall be recorded in the health record; 35 mm. photofluoroscopic films and report shall be forwarded to the Bureau of Medicine and Surgery; if other film is used in examination, only the reports shall be forwarded to the Bureau of Medicine and Surgery. If examination in any case is not made, this shall be noted in the health record and examination shall be made at the first place of duty where Naval x-ray facilities are available and report of examination recorded in health record and report forwarded to the Bureau of Medicine and Surgery." These instructions likewise apply to prospective Aviation Cadets; Candidates class for commission, U. S.

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Marine Corps Reserve; applicants for the Naval Academy; all applicants for appointment, including Nurses, U. S. Navy and U. S. Navy Reserve and also Reserve and Retired Officers and Nurses recalled to active duty.

Late in March of this year, the Chief of the Bureau of Medicine and Surgery sent out a questionnaire to all stations where photofluoroscopic examinations were being conducted requesting that the following data be submitted to the Bureau:

1) Total number of examinations made since the beginning of the procedure.

2) Number of cases diagnosed as tuberculosis, active and inactive.

3) Number of standard 14 x 17 in. confirmatory roentgenograms made.

4) Defects other than tuberculosis noted.

5) Any comments which might be of aid in evaluating this method of chest survey.

These reports have been received and are complete up to about the 1st of April this year.

The figures are as follows:

1) At the Naval Training Station, Great Lakes, Ill.

Total 35 mm. exposures			52,635
Active tuberculosis	54 cases	or	.10%
Inactive tuberculosis	44 cases	or	.08%
Standard check films	618	or	1.17%

2) At the Naval Training Station, Norfolk, Va.

Total exposures			46,686
Active tuberculosis	48 cases	or	.10%
Inactive tuberculosis	147 cases	or	.32%
Standard check films	700	or	1.50%

3) At the Naval Training Station, San Diego, Calif.

Total exposures			36,878
Active tuberculosis	26 cases	or	.07%
Inactive tuberculosis	28 cases	or	.08%
Standard check films	782	or	2.12%

4) At the Marine Corps Base, San Diego, Calif.

Total exposures			30,493
Active tuberculosis	43 cases	or	.14%
Inactive tuberculosis	57 cases	or	.19%
Standard check films	184	or	.60%

5) At the Naval Training Station, Newport, R. I.

Total exposures			31,498
Active tuberculosis	55 cases	or	.17%
Inactive tuberculosis	398 cases	or	1.26%
Standard check films	141	or	.45%

6) At the Marine Barracks, Parris Island, S. C.

Total exposures			44,612
Active tuberculosis	39	cases or	.09%
Inactive tuberculosis	107	cases or	.24%
Standard check films	193	or	.43%

7) At the Naval Academy, Annapolis, Md.

Total exposures			4,496
Active tuberculosis	8	cases or	.18%
Inactive tuberculosis	4	cases or	.09%
Standard check films	39	or	.87%

Grand total from all stations:

Total 35 mm. expostures			247,257
Active tuberculosis	273	cases or	.12%
Inactive tuberculosis	786	cases or	.32%
Total active and inactive cases	1,059	or	.45%

In those cases recorded having active tuberculosis the diagnosis had been confirmed by clinical study.

Two additional units have been purchased and are in operation at the Marine Barracks, Quantico, Va., and the Naval Air Station, Pensacola, Fla. No figures from these stations are available as yet. Additional units have been ordered and before many months elapse we should have thirty-six units in operation.

These figures do not represent a true index of the tuberculosis census in these localities. It must be remembered that these men have all had one or more rigid physical examinations prior to reporting to these bases and many obvious cases were rejected at the recruiting centers. Actually, these figures represent the number of cases missed upon physical examination. Also, many thousands of standard 14 x 17 inch roentgenograms have been made where photofluoroscopic units were not available and do not appear in these statistics.

It might be of interest to cite some of the conditions other than tuberculosis discovered during this routine examination of recruits. Some of the most frequent defects are given in the following table:

Calcifications, (hilar, parenchymal, etc.)	1,448
Calcifications, diffuse miliary	71
Scoliosis	209
Rib, anomalous	199
Rib, cervical	100
Azygos lobe	83
Exaggerated peribronchial markings	80
Hypertrophy, heart	66
Rib, bifid	66
Mitral configuration heart	62

Bronchiectasis	52
Heart, prominent pulmonary conus	50
Pleurisy, chronic	55
Pneumonitis	22
Dextrocardia	21
Adhesions, diaphragm	13
Smooth elevation of diaphragm	11
Emphysema, marked	9
Rheumatic type heart	7
Pneumothorax	7
Pneumonia, broncho	7
Eventration diaphragm	5
Tumor mediastinum	5
Atelectasis chronic	4
Aortitis	4
Abscess, pulmonary	4
Pleural effusion	3
Cyst, lung	2
Congenital type heart	2
Coarctation of aorta	1
Fungus infection	1
Hodkin's Disease	1

Numerous other minor conditions were found in addition to those listed.

The comments submitted by medical officers having cognizance of this photofluoroscopic program proved to be most interesting. Most officers were amazed at the clarity of detail on the 35 mm. film and the almost complete absence of distortion. Most officers reported that during the first months of operation, numerous check examinations, using the standard 14 x 17 in. roentgenogram, were made. However, as experience was gained in reading these microfilms the number of check examinations was reduced to about 12 per 1000 as it soon became apparent that very little additional information was gained in the standard film, except for fluoroscopy and additional views. All reporting officers were impressed by the technical simplicity of handling the 35 mm. film, particularly as regards processing, and by the efficiency of the simple routine worked out for the handling of large numbers of recruits daily. Recently at our larger stations from 800 to 1000 exposures have been made daily. The reading of this large number of films requires the services of two radiologists. Our radiologists prefer to use a viewer which enlarges about 4 diameters rather than a projector. The type of viewer has recently been very much improved and the reading of these microfilms should now entail less eye fatigue. The life of the tube has averaged about fifteen thousand exposures.

In conclusion: The results obtained in over a year's practical experience with 35 mm. fluorography has convinced us that this method satisfactorily meets the requirements of our main objective —that is, the weeding out of the tuberculous from among our recruits in a rapid, economical and efficient manner.

PERTINENT DATA CONCERNING THE PHOTOFLUOROSCOPIC PROGRAM AMONG PERSONNEL IN THE U. S. NAVY

Station	*Total No. Exposures*	*Tuberculosis* *Active* *No.*	*Pct.*	*Inactive* *No.*	*Pct.*	*14 x 17 Film Check* *No.*	*Pct.*
Marine Barracks, Parris Island, S. C.	44,612	39	.09	107	.24	193	.43
Naval Training Station, Newport, Rhode Island	31,498	55	.17	398	1.26	141	.45
Naval Academy, Annapolis, Md.	4,496	8	.18	4	.09	39	.87
Naval Training Station, Great Lakes, Ill.	52,635	54	.10	44	.08	618	1.17
Naval Training Station, San Diego, Calif.	36,837	26	.07	28	.08	728	2.12
Marine Corps Base, San Diego, Calif.	30,493	43	.14	57	.19	184	.60
Naval Training Station, Norfolk, Va.	46,686	48	.10	147	.32	700	1.50
TOTAL	247,257	273	.12	786	.32	2,657	1.07

The above does not represent a true index of Tuberculosis in these localities. Many obvious cases were eliminated at recruiting centers by physical examination.

The opinions or assertions contained herein are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.

The Tuberculosis Problem in the Veterans Administration*

ROY A. WOLFORD, M.D., F.C.C.P.**
Washington, D. C.

Judging from the experience gained during and after the World War, the morbidity rate of pulmonary tuberculosis, both in the civilian population and in the armed forces, can be expected to increase from the present military and naval operations.

It has been stated[1] that in the last war the death rate from pulmonary tuberculosis in Germany was doubled between 1914 and 1918. As a causative factor in this marked increase in the German army, little importance has been attached by Dr. Diest of Giessen to projectile wounds of the lungs, to the loss of limbs, to poison gas or to prophylactic inoculations; but he believes considerable significance should be attached to general anesthesia associated with loss of blood, to transport and prolonged operations. One observer is quoted as having found that fifty per cent of the soldiers suffering from pulmonary tuberculosis had undergone general anesthesia for some war injury.

In England[2] the death rate from tuberculosis rose between 1915 and 1918, and declined thereafter. The effects of war conditions were more pronounced in England than in Scotland. In France the effects were still more pronounced. These data have been interpreted to show that war time conditions can be withstood for a year or more, but that the after-effects, insofar as tuberculosis is concerned, are cumulative.

Reports[3] from England relative to the present situation indicate that from the start of the present military and naval activities, as in the World War, mortality from tuberculosis began to rise. Figures for Scotland, given in quarterly returns, show, according to the *Lancet*, that the total deaths from tuberculosis, both in the third and fourth quarters of 1940, exceeded those in the corresponding quarters of 1939, an increase of twelve per cent being noted for males and fifteen per cent for females. This increase has been greatest in the younger age group.

The records of the office of the Surgeon General, War Department (quoted by Jacobs[4]), covering the World War, show for the whole army and for the period April, 1917, to December, 1919, a total of

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**Assistant Medical Director, Tuberculosis Division, Medical and Hospital Service, Veterans Administration.

30,607 cases of tuberculosis of all forms. Of this number, 2,766 died. There were, in addition, 22,812 discharges for disability from tuberculosis; and, December 31, 1919, there were 13,029 soldiers who had not been discharged and had not died. It appeared that tuberculosis of the lungs stood first among the causes for disability discharges for officers, native troops and for American enlisted men, in all countries where they were serving, with the exception of the white troops in Panama.

Pollock[5] states that in a survey of a group of American soldiers, including older soldiers, younger soldiers and recruits, ranging from 19 to 51 years, proposed for foreign service, tuberculosis of some type was found in 23 of each 1000 persons who were physically examined. Their processes were classified as follows: arrested re-infection tuberculosis, 8 per 1000; active, 2 per 1000; primary healed tuberculosis, 13 per 1000. He concludes on the basis of these figures that in a group of 20,000 individuals there would be 40 active cases of tuberculosis, 160 showing arrested re-infection type of tuberculosis, and 230 showing healed primary tuberculosis.

The annual report[6] of the Surgeon General, War Department, for the fiscal year ending June 30, 1940, shows a general hospital admission rate for tuberculosis of 1.8 cases per 1000 for enlisted men and 1 case per 1000 for officers for that year.

Many intangible factors, the majority of which at present cannot be accurately determined, will influence the future case load of tuberculous beneficiaries of the Veterans Administration. Principal among these will be: (1) the eventual numerical strength of the armed forces; (2) the duration of the war; (3) the theatres of operation for the armed forces, especially as to whether those theatres shall be in the torrid, temperate or frigid zones, and their respective distances from the United States; and, finally, (4) the terms of such future legislation as the Congress may enact.

The Congress, in the Act of June 7, 1924, authorized an extension, up to January 1, 1925, (or over six years after the Armistice of November 11, 1918) of the so-called presumption of service origin of tuberculosis which had developed to a ten per cent degree. That presumption had, by law, been first authorized for two years after discharge; was lengthened later to three years; then finally authorized for up to January 1, 1925.

The problem of the proper care and treatment of its veterans, which confronted the Nation during and after the World War, was difficult. Numerous factors contributed to confusion and delay in the shaping of a program fitted fully to the situation. There was, no doubt, some misconception of the true problem, and in part it had to be solved through trial and error. Nor has it been wholly disposed of; for at present, after over a score of years, new difficulties are met by the Veterans Administration as a result of the changing age-

group of its beneficiaries, and the shifting viewpoints of the public as to the proportionate responsibility of the Federal government and the States and local communities, in the care of tuberculous ex-members of the armed forces.

What were some of the early difficulties mentioned? Briefly, the more important[4] were: some indefiniteness as to disability compensation benefits and as to criteria for determining service-connection of disability; the lack of an adequate hospitalization plan; a dearth of trained medical and nursing personnel; the breaking-down of discipline; and political, sentimental and personal considerations that entered into and affected the plans of expert consultants.

Let us review some of the early steps to meet the problem. Basically, the original War Risk Insurance Act provided that hospitalization and medical treatment should be furnished the disabled applicants. However, no agency[9] was designated by the Act; but it appears it was the intent of Congress that the Army and Navy would furnish treatment for the disabled men of the respective services, in their own hospitals. It was planned by these services that the men would be retained in service until they were physically and industrially rehabilitated. The compensation rate of $30 per month for temporary total disability, as authorized in that Act, was obviously intended to take the place of the Army or Navy pay, and to serve as an inducement for the disabled soldier, sailor or marine to remain in the service until he could be discharged as having attained maximum rehabilitation.

Proceeding on this premise, the Army and Navy prepared plans to provide beds to meet this contingency. But, as action was going forward to provide sufficient beds, the Armistice was signed and the war was suddenly ended. Immediately, a marked psychological reaction set in.[4] Every man wanted to return home—the disabled and the well, the man who needed care and treatment, and the officers and men of the Medical Corps, other than regular establishment, who were to have manned the proposed Army and Navy hospitals. This feeling spread to the home. It was not long before every possible influence was brought to bear, and demobilization was speeded up. Demands became insistent that the men be discharged immediately. The plans for reconstruction and rehabilitation that had been so carefully worked out in 1917 and 1918 were disregarded.

Then, a short time later, the opposite reaction occurred, and there was an insistent demand for beds to provide hospitalization and medical treatment for those discharged men. The United States Public Health Service was called on in the emergency and agreed to take over the responsibility. That organization was authorized to take over from the Army and Navy all hospitals and equipment not absolutely needed by the services. About nine thousand beds were provided in 1919 and 1920 in this way, many of them being in tem-

porary cantonment hospitals. Civilian hospitals were utilized on a contract basis for a part of the enormous case load, and facilities of the National Home for Disabled Volunteer Soldiers were pressed into service. At this juncture, three major Federal agencies—The Bureau of War Risk Insurance, the Federal Board for Vocational Education and the United States Public Health Service—were sharing the responsibility for awards of monetary benefits, and for the care, treatment and rehabilitation of these potential beneficiaries. Under these circumstances of divided and frequently overlapping responsibilies, the fact that the three agencies were able to render as efficient service as they did, is a tribute to the various administrators who were responsible for their respective activities.

In 1921 the hospitals were transferred to the jurisdiction of the Veterans Bureau, which had been created through legislative action consolidating the Bureau of War Risk Insurance, the Rehabilitation Division of the Federal Board for Vocational Education, and the medical functions of the United States Public Health Service that were related to ex-members of the armed forces. A further consolidation of the several bureaus responsible for the administration of laws governing benefits to veterans of all wars was effected in 1930 by the merger of the Veterans Bureau, the Bureau of Pensions and the National Home for Disabled Volunteer Soldiers, into the present Veterans Administration. It was through these organizational changes that centralized control of all functions pertaining to veterans' benefits, including hospitalization and out-patient treatment, was first made possible.

During the early years more than half of the tuberculous beneficiaries who were undergoing hospitalization were classed as ambulatory cases, but as time elapsed a steadily increasing number were properly classified as bed patients. This parallels the experience of other sanatoria, that, during the last ten years, a larger proportion of tuberculous patients than in previous years has been admitted with far-advanced lesions. Our present picture of pulmonary tuberculosis shows the percentage of patients, according to the extent of pulmonary involvement, falling under the following classifications: 4 per cent minimal; 22 per cent moderately advanced, and 74 per cent far advanced.

Our standardized "sanatorium regimen" for tuberculous patients, developed over the period of years since the World War, represents an application of intensive methods of treatment. In our program of tuberculotherapy, surgical collapse in some form plays an important role. In our facilities, where a patient can "take the cure" for many months without cost to him, a conservative approach to surgical collapse has been indoctrinated. The number of cases which we have treated by collapse therapy is slightly over 18 per cent. A high ratio of advanced cases and older patients (the average age of

the hospitalized veteran is nearing 50) has tended to decrease that percentage. With fewer advanced cases and with younger patients expected to be hospitalized from the present armed forces, collapse therapy will be more frequently resorted to as a method of treatment.

The tuberculous beneficiaries we have so far been receiving from the present armed forces differ somewhat from our World War patients. Their educational level is much higher and their psychological reaction to the disease is brighter. It is expected, among other things, that it may be necessary to change some of our present methods of attack. A modified diagnostic classification for some of this new group of patients may be required—one based on the economic and social history of the individual. And, administratively, this may lead to a policy of adequate domiciliation and isolation of patients apart from the hospital proper, since the majority of these younger beneficiaries will sooner or later reach the stage of chronic ambulancy.

We achieve, with cooperative patients, a percentage of arrests that is comparable to that reported by the better sanatoria, despite the fact that we cannot select applicants for hospitalization, but must accept beneficiaries with any type of lesions; and, since the treatment is without expense to our patients, their average hospital residence is longer with us than in State, city or private sanatoria, as a rule. Yet our hopes for larger curative results, in the usual sense, are often disappointed because of the lack of cooperation in many of our patients. They take a discharge against medical advice before completion of treatment because they have not the patience to conform to hospital routine.

In 1935 a "Surgical Collapse Board" was set up at each of our tuberculosis facilities. This board, consisting of five members—the clinical director, a tuberculosis specialist, a chest surgeon, the roentgenologist and the ward physician of the patient—studies each patient on admission and at three-month intervals thereafter to decide whether he should receive or continue to receive conservative sanatorium treatment, or whether, in the presence of appropriate indications, surgical collapse of one type or another is indicated. Coincident with the organization of these boards, several chest surgery centers were established in facilities at strategic locations throughout the country. At present, we have eight such chest surgery centers, where outstanding internationally known consultant chest surgeons are available on a part-time status for consultation and actual operative chest surgery. This has permitted of the training of several promising full-time surgeons in chest surgery, competent to perform all types of surgical collapse therapy.

As of March 31, 1942, there were occupied 4,941 of the total of 5,217 beds available for tuberculous beneficiaries of the Veterans

Administration. Of that total, 3,867 beds are in facilities constructed primarily for such patients, while 1,350 are in separate units of facilities mainly for the general medical or surgical or the neuropsychiatric types of patients. During the fiscal year 1941, 9,716 cases of pulmonary tuberculosis were admitted to our facilities, a total of 14,681 individuals with tuberculosis received hospital treatment, and 10,044 were discharged for various reasons, of which 1885 or 18.77 per cent were for death. The average length of hospital residence for that total of discharged beneficiaries was 174.3 days.

The most active year in the experience of the Veterans Administration, insofar as hospital admissions and discharges of tuberculous patients is concerned, was the fiscal year 1922. From then on there was a steady decline in the number of such patients remaining in hospitals at the end of each fiscal year, until 1940. when that number began to show an increase which has continued and is expected progressively to expand.

The capital investment in twelve tuberculosis facilities of the Veterans Administration, from March 3, 1919, to June 30, 1941, totaled $22,925,097.78, while the approximate cost of paying disability compensation or pensions to tuberculous veterans of the World War, for the fiscal years 1919 to 1941, inclusive, has been almost $911,000,000. Over $899,000,000 of those payments were for service-connected disease, while slightly less than $21,500,000 was expended for permanent total disability awards for non-service-connected tuberculosis.

An estimate of the future cost to the taxpayer for benefits—treatment and monetary, including disability pensions and government life insurance payments—to tuberculous beneficiaries coming from the present armed forces cannot be hazarded; but when the figures I have just given, representing costs of former wars, are considered with the probability that perhaps from six to eight million men may eventually be enrolled for military and naval service, it can safely be assumed that future cost will be great.

We have already begun to feel this new patient load. During the sixteen months from January 1, 1941, to April 30, 1942, 693 men discharged from the Army for disability from pulmonary tuberculosis in line of duty have been admitted directly into our facilities, and, at present, we are hospitalizing this new group of young ex-soldiers at a rate of approximately 100 a month.

At all induction stations of the Army roentgenographic study of the chests of both selectees and volunteers is now a regular practice. This measure, the adoption of which was urgently recommended by the Veterans Administration and by tuberculosis specialists, must necessarily exclude a considerable number of persons with tuberculous lesions whose condition would quite likely have escaped recognition through physical examination only. But just how much these

rejections will affect the total of discharges from the armed services for disability from tuberculosis remains to be seen.

Jones,[7] in 1940, stated that the World War had already cost Canada $150,000,000 for treatment and pensioning of its tuberculous soldiers; and he quotes a table, published by the Department of Pensions and National Health, Canada, showing 4,460 living pensioners as of March, 1937, whose major disability was from pulmonary tuberculosis.

One can readily see from the statistical data I have cited, that tuberculosis exacts a heavy economic toll from any nation that engages in war. Those data relate only to persons who had served in the armed forces, and take no account of the eventual cost to the nation of those members of the civilian population who develop tuberculosis during a war period. Tuberculosis was already increasing in this country during the period of war preparations, as evidenced from a report in the April, 1942, number of the *Survey Mid-Monthly*[8] wherein it was stated that the 1941 incidence rates for New York City, Baltimore, Chicago, Detroit and Philadelphia all showed increases over 1940—one as high as 23 per cent. The report also stated that in New York the tuberculosis incidence was 2 per cent higher in the first seven weeks of 1942 than in the same period in 1941.

From experience gained following the World War, it is believed that the Veterans Administration is now prepared to render a better organized service to the tuberculous beneficiaries who will come from the present Army and Navy than it offered in the same period after World War I. Hospitals and trained personnel are now available, there is a definite hospital expansion program, and the adjudicatory machinery is well-geared to make prompt monetary awards. It is hoped that the intensive tuberculotherapy and the standardized sanatorium regimen we can now provide will produce results comparable to those of the most progressive tuberculosis sanatoria in the United States.

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The Tuberculosis Control Program of the U. S. Public Health Service*

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The United States Public Health Service, in recognition of the danger of an increase in tuberculosis during war time, established an Office of Tuberculosis Control, early in 1942. It is the primary function of that office to stimulate, encourage, and coordinate tuberculosis control programs, both public and private, as an emergency health activity. In addition, the office has undertaken chest x-ray surveys in war industrial plants, as a demonstration of what mass x-ray surveys can accomplish in early case-finding of tuberculosis. The aim is to find the disease early, to bring remediable cases under treatment, and to conserve manpower by preventing the spread of this communicable disease.

Specifically, the objectives of the office have been defined as follows:

1) Widespread chest x-ray examination of workers and development of tuberculosis control programs in war industries.

2) Chest x-ray examinations and follow-up medical services for families in war industry communities, and especially for minority and underprivileged groups.

3) Extension of the chest x-ray examination procedures of the Army and Navy to Coast Guard recruits and seamen of the Merchant Marine.

4) Elaboration of a workable system, in cooperation with Selective Service and the armed services, for immediate reporting to State and City health departments of all recruits rejected because of tuberculosis. This would result in full advantage being taken of the case-finding being done by the medical corps of the armed forces. In March, 1942, there was unsatisfactory reporting of rejectees in 21 of the 48 States.

5) Tuberculosis consultation service to State health departments upon request, with a view to rapid inventory and reorganization of control programs on a war time basis.

a) Plan for coordination of the efforts of official and voluntary agencies on a State level to avoid duplication and to concentrate power.

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b) Accumulate current information on basic needs of each State so that a framework can be formed upon which to build a sound structure for tuberculosis control when the emergency is over.

Since the most important matter at the moment is war manpower, the Office of Tuberculosis Control, in cooperation with the Division of Industrial Hygiene of the National Institute of Health, has emphasized the need for mass case-finding, especially in the critical war industries. Eight photofluorographic units, including personnel and full equipment for processing of 35 mm. films, are available on loan to State health departments for use in demonstration projects, especially in industries without x-ray facilities. These demonstrations encourage large industries to procure their own equipment and personnel as part of their own industrial health programs.

Thirty-five millimeter chest x-ray films are used by the Public Health Service in surveys of war workers and Coast Guard recruits because it is believed that the small-film technique provides a satisfactory method of quickly and economically finding the vast majority of significant cases of tuberculosis in large groups of people.

Experience in Minnesota and Washington, D. C., has demonstrated that less than 10 per cent of minimal lesions are missed by this method. Advanced lesions are detected just as accurately as with 14 x 17 x-ray films.

If all tuberculosis in this country except 10 per cent of the minimal cases was discovered, and if adequate treatment facilities were provided, the control of this disease would be a simple matter. As a matter of fact, one-third of the so-called minimal cases discovered by x-ray examination are inactive when studied clinically, and an additional one-third are questionably tuberculous because the clinical findings do not warrant anything but an indeterminate diagnosis. So, the actual proportion of significant cases of minimal tuberculosis not detected by the small-film method is closer to 3 per cent than 10 per cent. This amount is not of much concern from an epidemiological point of view.

The task of the United States Public Health Service is to protect the public health to the fullest extent possible with the funds appropriated by your government for that express purpose. An important part of the protection of the public health is the control of tuberculosis. This is a recognized public responsibility. Early diagnosis of this communicable disease on an effective scale is dependent upon x-ray examination of the chests of the greatest possible number of people. With the limited resources available to us for this purpose, sound scientific judgment dictates that the method used must be one which benefits the group rather than primarily the individual.

In the fight to conserve manpower for war production, tuberculosis is an insidious enemy worthy of consideration. It now affects

one per cent of our manpower, and under war time conditions of crowding and overwork the opportunities for its spread are increased. In controlling it, time is of the greatest importance. The private medical practitioner cannot undertake x-ray surveys on a sufficiently large scale to affect noticeably the total group involved.

In emphasizing the value of mass x-ray surveys there is no intention to detract from the valuable contribution that can be made by specialists in the field of tuberculosis, within the limits of the time they have available for public health services.

Time is very important to the tuberculosis specialist in these troubled days. Not only is there a shortage of physicians but the specially trained ones have unusually important roles to play. There are many ways in which these experts can help in essential civilian assignments during war time, for example:

1) They can encourage and assist in case-finding programs in private industry. Industrial case-finding should include the families of workers.

2) They can assist in the reading of x-ray plates whenever trained full-time personnel is not available in the State or local health departments.

3) They can participate in local clinic programs for the purpose of classifying clinically, and determining the need for treatment, of recruits rejected by the armed forces, when rejection has been based on chest x-ray film alone, without clinical study.

4) Tuberculosis specialists can be of great service by stimulating the wider application of the principle of routine x-ray examination of all persons admitted to general hospitals and hospitals for the mentally ill, where undetected tuberculosis is unusually prevalent.

5) The tuberculosis specialist can do his utmost to encourage local governments to provide and maintain sufficient sanatorium beds for remediable and communicable cases of tuberculosis, especially during war time, when sanatorium personnel is likely to be depleted.

It is imperative that all men and material to fight tuberculosis be mobilized immediately if the task of preventing the expected war time rise in tuberculosis mortality is to be successfully carried out. The members of your organization can perform a real service if each will do his or her share of the necessary work. The United States Public Health Service earnestly solicits your cooperation and support in keeping tuberculosis under control during war time.

The Relationship Between the National Research Council and the Medical Services*

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The National Research Council was established by the National Academy of Sciences at the request of President Woodrow Wilson in 1916, as the active agent of the Academy in advising the Federal government on problems of national defense. The National Academy itself had been established by President Lincoln during the Civil War for essentially the same purpose. In the intervening years the complexity of science had so increased that at the time of the first World War a special operating branch was needed to fulfill the original purpose, and thus the National Research Council came into being. It acted from 1916 to 1918 as the Department of Science and Research of the Council of National Defense. So notable was its service then and so promising for the future were its activities that it was perpetuated by executive order after the war.

The advent of hostilities in Europe in 1939, and the evident probability that the United States would be drawn into the conflict, again gave the National Research Council a vital part to play. In the present war, more than in any other, both offense and defense are dependent on scientific development.

The Council is composed of nine major divisions representing the different fields of science, such as chemistry, physics, agriculture, medicine, etc. Each division is made up of representatives from the leading scientific societies in its field. In the Division of Medicine of the Council, for example, are representatives of seventeen societies, including the American Medical Association, The American Surgical Association, the American Dental Association, the American Veterinary Medical Association and special societies in the fields of pathology, bacteriology, psychiatry, pharmacology, tropical medicine, etc. The Council, thus formed, has been described as a democratic organization acting for the great body of scientific men in the United States.

Early in the course of hostilities in Europe various Federal agencies and particularly the officers of the armed forces began drawing on the Research Council for advice and technical assistance. In May

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*Presented on June 7, 1942, before the American College of Chest Physicians, Atlantic City, New Jersey.

***Note:* Since this paper was read, Dr. Long has been commissioned a Lieutenant Colonel in the U. S. Army Medical Corps.

of 1940 the Surgeons General of the Army and Navy requested the Division of Medical Sciences to establish technical committees to give advice on military medical problems. The questions that appeared of greatest urgency at that time were the treatment of war injuries, the control of infectious disease and the treatment of traumatic shock. As other problems became clear the machinery set up for advice in the first fields named provided a model for assistance in other branches of medicine. In January, 1941, there were seven main committees and thirty-one subcommittees. At the present time there are forty-four committees altogether.

From the outset liaison officers from the Office of the Surgeon General of the Army Medical Corps and the Bureau of Medicine and Surgery of the Navy Medical Corps have met with the various committees. Those originally assigned by their respective offices and active ever since were Col. (now Brig. Gen.) C. C. Hillman of the Army, and Comdr. (now Capt.) C. S. Stephenson of the Navy. In addition, there have been numerous contact officers from the Army, Navy, U. S. Public Health Service, Veterans Administration and the Selective Service System, acting as representatives in special fields of medicine and public health.

The American College of Chest Physicians is naturally interested in the organization effected by the Council for assistance to the armed forces in the fields of specialization of the College. Under the Committee on Medicine of the National Research Council there is a Subcommittee on Tuberculosis and under the Committee on Surgery a Subcommittee on Thoracic Surgery. These committees have frequently met in Washington with representatives of the armed services and considered problems of importance for the present military effort.

The first problem confronting the Subcommittee on Tuberculosis was standards for acceptance for military service. The committee met on July 23, 1940. Its first recommendation was that all men have a chest x-ray film, in order to exclude tuberculosis, before induction. Standards were at the same time prepared, limiting acceptance to men wholly free from roentgenographic evidence of tuberculosis or possessing at the most strand-like scars of arrested lesions not exceeding minimal in extent. Every effort was made at the time by the office of the Surgeon General of the Army to make chest x-ray films as nearly universal as possible. Although in the first six months this was possible in only 50 per cent of the men examined, by January 1, 1942, x-ray examinations was mandatory in all areas. The Navy, with its smaller personnel, had x-rayed all entering men from a period considerably prior to hostilities.

Later, in November, 1941, the Subcommittee on Tuberculosis rewrote its recommendations of standards for recommendation and

rejection in the Army in the light of the experience of the first year of induction and with suggestions from Army medical officers for certain specific definitions. With slight modifications these recommendations are incorporated in the current edition of *Standards of Physical Examination During Mobilization,* MR 1-9, issued by the War Department, March 15, 1942.

In another important field the Subcommittee on Tuberculosis has been active, viz., in the preparation, for the surgeons general, of a list of qualified specialists in tuberculosis with an evaluation of technical capacity in certain lines. This document, like many of the results of work in the Council, is necessarily a confidential report. It will require frequent revision as new men appear in the field and those previously listed increase in ability and specialization.

Improvement in the methods of reporting rejection for tuberculosis is one of several current problems. Solution is expected in the course of meetings planned for the immediate future.

This brief and incomplete summary in the field of tuberculosis indicates the nature of the activities of the Research Council. The work of the latter is increasing and should prove of value not only in the present military program, but in the reconstruction that will be necessary after the war.

Tuberculosis in Our Industrial Army: An Appeal to Management and Labor

It is now unquestioned that an increase in tuberculosis morbidity and mortality will be an inevitable result of war conditions. Overcrowding, limitation of protective foods, limitation of fuel, shortage of hospital beds, the mass entry of women into industry, poor housing conditions, and the general war strain will tend to undo the great progress made during the past several years which has resulted in the lowering of the mortality rate of tuberculosis.

The above statements are borne out by a report of the Medical Research Council of England showing the general trend of tuberculosis deaths in 1939-41. They make the startling statement: "What is perhaps not so clearly realized is that the comparative increase in tuberculosis mortality is twice as severe in 1939-41, World War II, as it was in 1914-16 of World War I, and has extended more into early childhood and later adult life."

The gradual annual decline of the tuberculosis death rate among residents of large American cities has become practically stationary for the past two years, and actually shows an increase in the death rate in many of our largest cities. This is reported by the statistical division of the National Tuberculosis Association.

Tuberculosis still claims half the total deaths of all causes between the ages of 15 and 24 years. Recent figures show that among our supposedly healthy adolescent population between the ages of 18 and 24, 3 per thousand have unsuspected active tuberculosis, and that more than 1 per thousand is a potential source of infection. This state of affairs is due to the fact that it is only upon the arrival of symptoms, and not always then, that the patient seeks medical advice.

In a recent mass x-ray survey of 1557 war workers in one plant, 107 films showed childhood type infection, 56 showed the reinfection type, 22 of which were active. None of these persons were known to be tuberculous at the time the survey was made. This rate is perhaps eight to ten times the average found in the general population, according to older figures, and demonstrates the relatively high incidence rate of significant infection in industrial workers.

In every mass x-ray survey many important diseases other than tuberculosis may be found, such as bronchiectasis, neoplasms, and cardiovascular changes.

Occupation has always played an important role in the incidence and mortality of respiratory tuberculosis. The lower tuberculosis death rate among women than men during the principal working period of life is a striking evidence of this fact.

It is significant that tuberculosis has increased alarmingly in adult women of England because of the fact that so many have become industrial workers. Since millions of women in the United States are now entering industrial work, it is reasonable to expect the same increase in the incidence of tuberculosis among women of this country.

From reliable government reports there are now 59,000,000 workers in this country. Eighteen million of them are on war production, and in

another year there will be 30,000,000, of which 13,000,000 will be women.

An x-ray examination of the chest is now a "must" for every soldier, sailor, marine, WAAC, WAVE and SPAR. The next most important step is to take the same precaution among our equally essential industrial army.

As stated above, "It is only upon the arrival of symptoms, and not always then, that the patient seeks medical advice." By x-ray examination, we can reverse this condition. The physician can seek out the patient, and not wait until the patient seeks him.

Labor must protect itself against the loss of health, the contracting of communicable disease from a fellow worker, and the fatal consequences of not knowing of the presence of a curable disease in an early stage.

Management must protect itself against future liability caused by the ignorance of the state of the worker's health and by failure to protect him from the ill health of the worker by his side.

The expense of making x-ray examinations of employees is surprisingly slight.

Assuming an average annual wage scale of $2,000.00, the cost of biennial chest x-rays made at the plant, and including the time lost by the worker, need not exceed one-twentieth of one per cent of the payroll, or one half a mill on the payroll dollar.

The mechanics of conducting a mass x-ray survey have been worked out in hundreds of plants, large and small, through the cooperation of management, labor and the plant medical service.

By putting every available x-ray machine to work finding tuberculosis, we can prevent many setbacks to our industrial war effort, and to the problems of peace which would necessarily become more complicated by the inevitable increase in the number of tuberculosis casualties.

Case-Finding in Industry

The greatest step toward the control of tuberculosis in the history of the world was taken when our War and Navy Departments adopted the policy of x-raying the chests of every man and woman entering our military forces. By the end of the war, more than 20,000,000 x-rays of chests will have been made, including both those accepted for military service and those rejected for any physical disability. While the procedure is not without imperfections, no one can doubt the value of this nation-wide, mass x-ray survey. It is the greatest case-finding program ever undertaken. If the army and navy sensed the value of excluding all possible tuberculosis from our military army, is it not equally important that we attempt to exclude at least all active cases from our industrial army. This great industrial army is just as essential to victory as is our fighting forces. All leaders in the fight against tuberculosis agree that our industrial army should have the same protection against tuberculosis as the members of the armed forces. It is believed by those who have given this matter serious thought that there will be an increase in the incidence of tuberculosis among workers in our war industries because the increased numbers of employees in all war industries have increased the danger of infection by widening the range of infectivity. Then, too, in order to meet the demands for more workers, the employment of persons suffering from

undetected tuberculosis who probably in ordinary times would not be employed, multiply the foci of infection.

There are thousands of new workers in industries who have always led a sheltered life, but for patriotic and economic reasons are now meeting for the first time the unfavorable conditions of "herd" life. Fatigue is a predisposing factor, and general resistance is lowered by inadequate amount of rest and recreation. Crowded living quarters, "swing shift" hours affect home conditions adversely, and perhaps are more responsible for tuberculosis in workers than their industrial environment.

In spite of the years devoted to educational programs in the promulgation of facts, it is quite evident that the great mass of our people do not appreciate the tragic issues involved as come before us as tuberculosis workers. Officials, both of management and labor, in certain industries and shipyards have been farsighted enough to cooperate with the United States Public Health Service, and certain other tuberculosis agencies in having their employees x-rayed. The mass x-raying of all industrial workers must be extended to the limits of our facilities.

The army and navy have set an example. Industry and labor should demand and assist in furnishing pre-employment x-ray examinations as well as mass x-ray examinations of all persons now employed, and further to assist in furnishing routine mass x-ray surveys at regular intervals.

It is of course highly important that the x-ray, highly valuable as it is as an aid to diagnosis, should not be regarded as a rule of thumb method of diagnosis. The interpretation of the radiograph requires skill and knowledge; therefore the employment of none but skilled and experienced physicians should be insisted upon. A radiograph should not always be the sole criterion of the presence of disease. If the mere presence of a tuberculous lesion in the chest as revealed by the radiograph in all cases led to the diagnosis of active tuberculosis, the wheels of industry would stop. Accurate diagnosis depends solely upon the tried and true methods, while at the same time, we should recognize that the x-ray is a valuable clinical instrument. It is a wise profession that will not be tossed about by contending winds of doctrine.

Believing in the importance of the protection of our industrial army as well as our fighting army, your Council on Military Affairs and Public Health prepared the foregoing article, to appear soon as a brochure which will be given wide distribution by our College Governors. We hope the appeal will encourage officials both of labor and management as well as local public health officials, tuberculosis societies, and plant physicians to arrange for mass x-rays of all industrial workers.

Council on Military Affairs and Public Health.
American College of Chest Physicians.

Honor Roll

The following is a complete roster listing 295 members of the AMERICAN COLLEGE OF CHEST PHYSICIANS on active military duty. This constitutes approximately 25 per cent of the College membership in the United States of America.

Maurice J. Abrams
Frederick F. Ackerman
*Louis Adelman
John Sellers Agar
Arnold Albert
Ralph M. Alley
Frank J. Altschul
Peter Amazon
Claude Anderson
Irving L. Applebaum
Roscoe E. Avery
*George F. Aycock
Lloyd R. Ayers

Robert H. Baker
Jacob E. Banquer
Harold R. Barnes
*John D. Barnwell
Jack D. Bartholomew
Garry G. Bassett
John L. Batty
Gerald A. Beatty
Morrison Belmont
Harry Beloff
Mitchell M. Benedict
*Lester E. Beringer
Robert D. Berke
Irving Besserglick
Oscar Blitz
Milton Blum
Joseph G. Bohorfoush
Paul K. Bornstein
*Berna T. Bowers
George S. Bowers
*Aubrey L. Bradford
Frank L. Bradley
*Enoch G. Brian
Sidney A. Britten
Donald W. Brodie
John J. Brosnan
David M. Brotman
Charles K. Bruhl

Russell J. Callander
*Earl C. Carr
Charles R. Castlen
Arthur H. Chernoff
Maurice Chernyk
Norman E. Cobb
Fred Cohen
Frank P. Coleman
Stuart R. Combs
William L. Cooke
*James P. Cooney
Franklin B. Cooper
*Paul M. Crawford
Jacob A. Crellin
Gerald L. Crenshaw

J. Emerson Dailey
William B. Davidson
John D. Davis
Paul V. Davis
*Alfred A. de Lorimier
Dominic A. De Pinto
Sidney Diamond
Henry L. Dorfmann
Ralph A. Dorner
Frederick M. Doyle
Everett C. Drash
*Robert E. Duncan
John C. Dundee
Joseph E. Dushane

Friedrich Engelbach
George F. Evans
David W. Exley

O. Jocevious Farness
C. Basil Fausset
Abraham Feinberg
Henry Felson
Ira Fink
Elliott Fishbein
James F. Flattery
*James H. Forsee
*Frederick H. Foucar
*Daniel Franklin
*Arden Freer
Russell H. Frost

Leon J. Galinsky
John E. Gardner
Paul W. Gebauer
Stephen M. Gelenger
Isaac I. Gellman
Joseph H. Gerber
Charles E. Gerson
William S. Gevurtz
Alfred Goldman
Benjamin E. Goodrich
Burgess L. Gordon
Nathan G. Gordon
Philip S. Gorlin
Arthur A. Gould
*Henry W. Grady
John G. Graham, Jr.
Edward A. Greco
*Mack M. Green
Edward W. Grove
*John B. Grow
Albert Guggenheim
Manuel Guzman, Jr.

Dominic J. Haftkowski
James L. Hamilton
Ralph B. Hanahan
Roger J. Hanna
*Robert M. Hardaway
Marvin S. Harris
David A. Harrison
Harlon W. Harrison
*John C. Hart
Carl A. Hartung
Bruno S. Harwood
Thomas G. Heaton
Charles E. Hellweg
Olin C. Hendrix
James J. Hennessy
Russell S. Henry
Vivian H. Hill
Albert W. Hobby
Arthur E. Holmes
George W. Holmes
Ralph H. Homan
S. Edwin Hughes, Jr.
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Linneus G. Idstrom
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Carl W. La Fratta
Swen L. Larson
*Frank Y. Leaver
Francis L. Lederer
A. A. Leonidoff
Lawrence Lercher
George L. Leslie
Oscar S. Levin
William G. Lewis
Benjamin H. Libien
Walter Lichtenberg
Paul B. Lingenfelter
Samuel Lipstein
*David E. Liston
Robert E. Lovgren
Bernard Lowenstein
Mischa J. Lustok

*Shelley U. Marietta
Jacob L. Marks
George E. Martin
*Horace P. Marvin
John A. Mathis
Roy M. Mayne
Leroy E. Mayo
Walter S. McDaniel
*Patrick I. McShane
John C. McSween
Henry E. Mehmert
Chester J. Mellies
James C. Metts
Louis J. Miller
Morell W. Miller
Raymond E. Miller
Samuel E. Miller
Dean H. Minnis
Bert E. Moore
James B. Moran
Dwight J. Mosier
Alvin B. Mullen
Dan W. Myers

Walter L. Nalls
Philip H. Narodick
David A. Nathan
William Newcomer
Thomas E. Newell
Herman J. Nimitz
Thomas O. Nuzum

Francis P. O'Hara
Orland S. Olsen

Luis A. Passalacqua
Joseph C. Placak, Jr.
Joseph N. Plumer
*William C. Pollock
Jaime F. Pou
Lawrence A. Pratt
Joel J. Pressman
Henkel M. Price
John A. Proffitt
James H. Putman

*Allan B. Ramsay
Jack Reiss
Charles A. Ribaudo
*Edgar Ricen
Charles W. Rieber
Eric P. Robbins
*Edwin H. Roberts
John C. Robertson
Galen A. Rogers
Jacob Rogoff
Paul W. Roman
Joseph G. Rosenbaum
Louis Rosenbaum
Elliot A. Rouff
Raymond C. Ryan

Paul C. Samson
Irving A. Sarot
James A. Schaal
Jacob Schloss
Leo V. Schneider
H. Charles Schock
Edward W. Schoenheit
Benjamin Schwartz
Joel J. Schwartzman
Charles A. Seelig
Morris Selman
Stanley N. Shaffer
David H. Shipp
Alexander Silverglade
Neill Simpson
John A. Sims
Leslie B. Smith
Michael Smith
Louis I. Sokol
Saul Solomon
William C. Spalding
Robert A. Staff
William W. Stanbro
*Earle Standlee
William B. Steen
Albert E. Steer
Henry H. Stelman
Cyrus W. Strickler, Jr.
Emanuel Sufrin
Lloyd K. Swasey
Herbert C. Sweet

Joseph Taymor
Harry E. Tebrock
*Carl W. Tempel
Powell M. Temples
Raymond E. Tennant
Kent H. Thayer
Peter A. Theodos
David R. Thomas, Jr.
Efton J. Thomas
*William L. Thompson
Donald J. Tillou
Lawrence O. Toomey
Darrell H. Trumpe
George D. Tsoulos

David Ulmar

Deane H. Vance
Harold M. Van Der Schouw
William C. Van Deventer
Ralph Volk

*John B. Wallace
Allan H. Warner
LuVerne J. Webster
Emanuel M. Weinberger
Meyer T. Weissman
Daniel W. Wheeler
William H. Weir
Hugh G. Whitehead, Jr.
Carl J. Wilen
Herman E. Wirth
Sidney E. Wolpaw
Joel T. Woodburn
Fletcher J. Wright, Jr.

*Charles T. Young
Richard W. Young

Julius Zelman

NOTICE

If you are in the Armed Services of our country and your name does not appear on this list, please notify the Executive Offices of the College stating your rank and mailing address.

In order to assure prompt delivery of your copies of the journal, please notify the Executive Offices of the College of any change of address.

COLLEGE NEWS

CHAPTER MEETINGS

INDIANA CHAPTER

The meeting of the Indiana Chapter of the College was held at the Columbia Club, Indianapolis, March 12. The meeting was held jointly with the Indiana State Tuberculosis Committee. The Indiana State Tuberculosis Association was represented at the meeting by Dr. Murray Auerbach, Executive Secretary. The Accreditation Plan for the Control of Tuberculosis, as advanced by the Minnesota Tuberculosis Committee, was discussed and it was recommended that the plan be further discussed by the officials of the Indiana State Tuberculosis Association. After lunch the following program was presented:

"The Role of the Bronchial Tree in the Spread of Tuberculosis"
Dr. Benjamin Brock, F.C.C.P., Louisville, Kentucky

"Bronchoscopy in the Diagnosis of Chest Conditions"
Dr. M. G. Buckles, F.C.C.P., Louisville, Kentucky

"Military Tuberculosis"
Dr. E. W. Custer, F.C.C.P., South Bend, Indiana

X-Ray Conference

Thirty-five members of the College attended the meeting, including Dr. Paul A. Turner, F.C.C.P., Louisville, Regent for Kentucky, and Dr. P. H. Reed, F.C.C.P., Paducah, Kentucky.

NEW YORK STATE CHAPTER

The New York State Chapter of the College met at Buffalo on May 5 in connection with the annual meeting of the New York State Medical Society. A joint luncheon was held at the Hotel Statler with the State Tuberculosis Committee. A program and round table discussion on tuberculosis and disease of the chest took place.

MINNESOTA CHAPTER

A meeting of the Minnesota members of the College will be held at Minneapolis on May 17 in connection with the annual meeting of the Minnesota State Medical Society in order to organize the Minnesota Chapter of the College. The following program has been arranged:

"Bronchiectasis"
Dr. H. C. Hinshaw, Rochester, Minnesota

"Bronchial Tuberculosis"
Dr. Robert J. Davies, F.C.C.P., Nopeming, Minnesota

"Silicosis"
Dr. Albert E. Russell, Senior Surgeon, USPHS, Governors Island, New York

"Experiences in a Program for the Control of Pulmonary Tuberculosis in Chicago"
Dr. Richard Davison, F.C.C.P., Chicago, Illinois

ILLINOIS CHAPTER

The Illinois Chapter of the College will hold its annual meeting at the Municipal Tuberculosis Sanitarium, Chicago, May 18. The meeting this year will be held jointly with the Illinois Trudeau Society and the Chicago Tuberculosis Society. The following program has been arranged:

2:00 P. M.—Talk by Dr. John B. Barnwell, Ann Arbor, Michigan
3:00 P. M.—Clinical Demonstration
5:30 P. M.—Dinner, Dr. Frederick Tice, Chicago, *Chairman*
7:00 P. M.—Business Meeting and Election of Officers
7:30 P. M.—"The Autonomic Nervous System in Relation to the Thoracic Viscera," Dr. Albert Kuntz, St. Louis, Missouri
8:30 P. M.—X-Ray Conference, Dr. Robert K. Campbell, F.C.C.P., Springfield, *Chairman*

MISSOURI CHAPTER

The Missouri Chapter of the College held its annual meeting at St. Louis on April 19. The following officers were elected for the ensuing year:

Dr. James L. Mudd, F.C.C.P., St. Louis, President
Dr. J. A. Stocker, F.C.C.P., Mt. Vernon, Vice-President
Dr. Melvin J. Tess, F.C.C.P., St. Louis, Secretary-Treasurer

NEW ENGLAND STATES CHAPTER

A meeting of the New England States Chapter of the College will be held at the Harvard Club, Boston, May 25. Dinner will be served at 6:00 P. M., and following this, a symposium on Tracheobronchial Tuberculosis will be given. The speakers will be:

Dr. Moses J. Stone—Medical Aspects
Dr. Norman J. Wilson—Bronchoscopic Aspects
Dr. William Meissner—Pathological Aspects
Dr. Richard H. Overholt—Surgical Aspects

For further particulars regarding the meeting, please communicate with Dr. U. E. Zambarano, State Sanatorium, Wallum Lake, Rhode Island, Secretary-Treasurer of the New England States Chapter of the College.

NEW JERSEY CHAPTER

The annual meeting of the New Jersey Chapter of the College will be held at Newark, New Jersey, in conjunction with the meeting of the State Medical Society, on May 25-26. The following program has been arranged:

"Congenital Cystic Lung," by Dr. M. J. Fine, Newark.

"A New Approach in Therapy of Pulmonary Cavities," by Dr. A. Crecca, Verona.

"X-Ray Symposium."

For further particulars regarding the meeting, please communicate with Dr. Irving Willner, 18 Waverly Avenue, Newark, New Jersey, Secretary-Treasurer of the New Jersey Chapter of the College.

TEXAS CHAPTER

The annual meeting of the Texas Chapter of the College was held at the State Sanatorium, Sanatorium, Texas, on May 9. The following program was presented:

PROGRAM

State Tuberculosis Sanatorium
Sanatorium, Texas

9:00 A. M.

1—Non-Tuberculous Spontaneous Pneumothorax
Dr. F. C. Carman, F.C.C.P., Dallas

2—Value of Analysis of Sputum Obtained from the Mouth in the Diagnosis of Pulmonary Mycosis
Dr. A. E. Greer, F.C.C.P., Houston

3—Leprosy and Tuberculosis, with Report of Case
Dr. C. J. Koerth, F.C.C.P., San Antonio

4—Clinical Demonstration
Members of the State Sanatorium

12 Noon—Dinner

Business Meeting
Inspection of State Sanatorium
Adjournment

CUBAN CHAPTER

The Cuban Chapter of the College held its regular monthly meeting at the Instituto de Vias Respiratorias, Havana, Cuba, March 3rd. The following program was presented:

"A General Review of Chest Surgery with Report of Two Cases of Pneumonectomy" by Dr. Antonio Rodriguez Diaz.

Discussion by: Drs. Gustavo Bergnes, Jose Lastra, Vicente Banet, Eugenio Torroella and Roberta Varela.

This meeting aroused great interest due to the fact that the first two cases of successful pneumonectomies in Cuba were reported. The session turned out to be a symposium on thoracic surgery in which clinicians, radiologists, anesthetists, bronchoscopists and thoracic surgeons participated. In addition to those mentioned above, Drs. J. Cenurion, P. Iglesias Betancourt, C. Rodriguez Remos, M. Martinez Curbelo, R. Barata, J. J. Castillo, T. Valledor, P. Farinas, Antonio Navarrete, and A. Antonneti, participated in the discussion.

A resume of the subject was presented by Dr. Ricardo Nunez Portuondo, one of the leading surgeons in Cuba.

The meeting was attended by a record audience and it has elicited much discussion and favorable comment in local medical circles. This meeting may prove to mark a turning point in the evolution of thoracic surgery in Cuba.

Dr. B. B. Bagby, Jr., has been appointed superintendent and medical director of Pine Camp, Richmond's tuberculosis sanatorium. Dr. Bagby has been serving as assistant medical director and will replace Dr. George A. Welchons, who resigned to enter private practice in Richmond.

The following Fellows of the College participated in the program of the Institute on Tuberculosis held at Birmingham, Alabama, on March 30, 1943:

"The Relationship of the Sanatorium to the Tuberculosis Program: Selection of Cases for Sanatorium Care," Dr. L. O. Davenport, F.C.C.P., Birmingham.

"Tuberculosis in the Negro," Dr. Kelly Joseph, F.C.C.P., Birmingham.

The program was sponsored jointly by the Alabama Tuberculosis Association, the Jefferson County Board of Health, the Jefferson County Tuberculosis Sanatorium, and the Jefferson County Anti-Tuberculosis Association.

Dr. C. Lydon Harrell, F.C.C.P., Norfolk, Virginia, was elected President of the Seaboard Medical Association at its annual meeting in Wilson, North Carolina, December 1-3, 1942.

Dr. Edgar Mayer, F.C.C.P., New York City, visited Mexico City during the month of March and gave a lecture by invitation before the Sociedad Mexicana de Estudios Sobre Tuberculosis at the National School of Medicine. Dr. Mayer spoke on "The Trend of Epidemiological Concepts of Tuberculosis." A dinner was given in his honor following the lecture. A luncheon was also given to him at the Bankers Club, Mexico City, by Dr. Gustavo Baz, Secretary of Public Welfare of Mexico. Dr. Mayer visited the public welfare institutions in Mexico with Dr. Baz. The officials and members of the College in Mexico were hosts to Dr. Mayer during his visit.

The annual meeting of the Arizona State Medical Association was held at the Pioneer Hotel, Tucson, April 30-May 1. The following members of the College presented papers:

"Demonstration of Heart Disease," Dr. Charles S. Kibler, F.C.C.P.

"Collapse Therapy for the Treatment of Tuberculosis in Patients of Advanced Years," Dr. Charles A. Thomas, F.C.C.P.

"Results of Thoracoplasty—A Five and Ten Year Study," Dr. Victor S. Randolph, F.C.C.P.

Obituaries

STIRLEY C. DAVIS

1882 - 1943

Dr. Stirley C. Davis was born in Owenton, Kentucky, October 25, 1882, a son of Mr. and Mrs. James M. Davis. Graduating from the Hospital Medical College at Louisville, Kentucky, in 1906, he entered on a medical career that was to last thirty-seven years and make him one of the best known physicians in Arizona.

In 1908 he began his gradual movement westward that was to end twelve years later when he came to Tucson from Oklahoma. While practicing in Oklahoma he met and married his present wife. To this union three children were born, two of whom lost their lives in automobile accidents.

The first World War interrupted his medical career briefly and he went overseas with the Thirty-fourth Division as a Captain in the Medical Corps.

In 1920, Dr. Davis arrived at Tucson where he helped found the Thomas-Davis Clinic. In 1927, he became president of the Chamber of Commerce and was instrumental in securing the location of the U. S. Veterans' Hospital at Tucson.

He was an ardent civic worker and he originated the plan by which physicians now serve on the Welfare Board and the patients are given the privilege of selecting their own physicians.

For the past thirteen years, he has been on the Board of Tucson School District No. 1 and he has served virtually half the time as its president. During his membership on that Board, a large building and expansion program of public schools in Tucson took place. He was responsible for better working conditions for teachers as well as improving the teaching personnel. Robert Morrow, superintendent of schools, said: "Dr. Davis was one of the finest men I've ever been connected with."

Dr. Davis also served as president of the Pima County Medical Association and as a Director of the Tucson Sunshine Climate Club. He was a Charter Member of the American College of Chest Physicians, a member of the Pima County Medical Society, the Arizona State Medical Society and American Medical Association.

He died at Tucson on March 14, 1943, at the age of 60. In his immediate family he leaves his wife, Mrs. Mabel Davis, and a daughter, Mrs. Harold T. Landon.

Charles S. Kibler, M.D., F.C.C.P.
Regent for Arizona

HUGH A. BEAM

1882 - 1943

Dr. Hugh A. Beam was born July 15, 1882, in Dakota City, Iowa. He graduated from Northwestern University Medical School in 1903 and practiced medicine in Iowa for a few years before coming to Moline in 1912.

In 1935, Dr. Beam was appointed medical director of the Rock Island County Tuberculosis Sanitarium. He was one of the founders of the first tuberculosis clinic in Rock Island County, which was established in Moline in 1919. He was also a member of the Moline Public and Lutheran Hospital staffs.

Dr. Beam served as a member of the Tuberculosis Section of the Selective Service Board in Illinois and as medical examiner for the draft board for rural Rock Island County. He served in the same capacity during World War I until 1918, when he resigned to become a Captain in the Medical Corps of the Army.

At the time of his death, Dr. Beam was serving as President of the Illinois Chapter of the College. He was a Charter Member of the American College of Chest Physicians, a Fellow of the American College of Physicians, a member of the National Tuberculosis Association, American Medical Association, Iowa-Illinois Medical Association, Illinois State Medical Society and the Rock Island County Medical Society.

He died at St. Louis, Missouri, March 30. Surviving are the widow; a son, W. A. Beam, in the Navy; two brothers, W. W. Beam of Rolfe, Iowa, and Charles Beam of Los Angeles, California; and two sisters, Mrs. John A. Owen of Toledo, Iowa, and Mrs. Charles E. Fraser of Yakima, Washington.

Robert K. Campbell, M.D., F.C.C.P.
Governor for Illinois